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AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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Columbian Exhibition Notes.

Editorial Correspondence.

With this we are able to present on pages 1 and 2 some views which give a very good idea of the general appearance of the interior of Machinery Hall on May 26, when the photographs were taken. The first three of these were taken from the gallery in front of Chief Robinson's office at the east end of the building, and represent views looking west through the three different naves extending through the main building and Annex, a distance of nearly 1,400 feet. All these views, except Fig. 4, were taken early in the morning when few people, except those at work in the building, were there. On either side of Fig. 1 are to be seen the runways upon which moves the Sellers crane, and below which are the lines of shafting. At the left of this view is the power plant, the arrangement of which is shown in the plan view of the hall, published in our issue of November 17, 1892. Owing to the fact that the engine which furnishes electric current to the Sellers crane was at the time suffering from some disorder the crane could not be moved, but was standing at the extreme east end of the runways, and the camera stood on it. To this fact is to be attributed the absence from the view of a group of Worthington pumps which should be nearest the observer at the left, beyond which are the engines as shown, the one whose fly-wheel pulley rises nearly to the height of the runway being the Allis 2,000 horse-power engine, the largest here. It stands upon an elevated platform and the cylinders are toward the observer. At the left of this against the outer wall is the main switch board for the electric system, this being of marble and a very elaborate affair. The switch board of the General Electric Company is near the observer and near the main aisle. It is also of marble, but at the time the photograph was taken was incomplete, and the men seen were at work upon it. Beyond the Allis engine are still other engines which do not show in the view, but some of which will be the subject of future illustrations, while still beyond these are the air compressors and a large paper making machine which is not yet running, but which will take in paper pulp at one end and turn out finished paper at the other.

Fig. 1.

Fig. 2.

At the right of Fig. 1 the space nearest the observer belongs to Canada, after which comes part of the French section, within which is seen the small mining car upon an inclined track. The section inclosed by a white cloth is to contain milling machinery and beyond this the covered pavilion is that of the Page Belting Company, yet beyond this being the display of American wood working machinery.

Commencing at the left of Fig. 2, the space nearest the observer in which the fire engine is to be seen is the other portion of the Canadian section, beyond which is also that portion of the French section not shown in Fig. 1.

The object seen in the center of the main aisle and apparently near the extreme end of the view is really near the further end of the main building, and is a soda fountain which stands upon a bridge spanning the tank, on either side of which are grouped the smaller pumps which draw their supply of water from this tank and make some display of its return. Just beyond the fountain and on both sides are the American machine tools, these being almost entirely within the Annex.

At the right of Fig. 2, and nearest the observer, is part of the section of Great Britain, the engine which drives the shafting for this being so near the gallery as to be out of sight. It is a Galloway compound, and will be illustrated later. Beyond the section devoted to the display of anvils from a single manufactory in England, are the only steam hammers shown in the Exhibition, there being two of these built by B and S. Massey, of Manchester. Beyond this is the English textile machinery, and then comes part of the German section. At the right of this view, and just beyond the soda fountain, is the section devoted to the mechanical press, where the headquarters of the AMERICAN MACHINIST will be found, in Section 27, Column K-37. On the runways seen in this view is the Yale & Towne crane, which dimly shows in the extreme distance.

In the foreground of Fig. 3 both sides are British territory, the belt which connects their two lines of shafting being seen nearest the observer. Beyond the British are the Germans on both sides, beyond them on the left being New South Wales, and on the right the American printing presses; both sides of that part of the Annex which appears in this view being taken up by the display of American textile machinery. The Morgan Engineering Company's

crane covers this bay and appears in the extreme distance.

Fig. 4 is a view of the central bay (the same one shown in Fig. 2), but is taken from the other end. In the foreground are some cars which have been run in with machinery for installation. Since the photograph was taken a good deal of this track has been covered by flooring, but that portion nearest the observer is still open for use. This view includes most of the space devoted to American machine tools, the partly erected planer, a portion of which shows at the right, being the Niles Tool Works 120 inch machine. Beyond this are the exhibits of Warner & Swasey, Brown & Sharpe Mfg. Co., Pratt & Whitney Co., Fox Machine Co., Detrick & Harvey and the Pond Machine Tool Works. On the left the first exhibit seen is that of the E. Horton & Son Co., beyond which are the Billings & Spencer Co., Gisholt Machine Works, Beaman & Smith, E. W. Bliss Co., Lodge & Davis Machine Tool Co., Hendey Machine Tool Co., and Hill, Clarke & Co. The names mentioned do not, of course, constitute a complete catalogue of all the exhibits, but are merely those which appear most prominently in the views given, it being the intention to deal separately with such of the exhibits as seem to require special mention.

Though rapid progress is being made in the work of completing the exhibits, so much yet remains to be done at this writing that the Exhibition must still be pronounced far from complete. And yet few who come here and go over it feel as though there was any lack of things to see in the aggregate, for it is a giant show.

People are not coming in as great numbers as the management desire, however, this being due probably to the combined facts that the Exhibition is not complete, that the railroads offer practically no inducements, and that people have been warned of the extortion which has been practiced here. Of the latter, however, it can be said that it has now largely been done away with, and that one can go in accordance with his purse somewhat, though as is always the case in such affairs, it is very easy to spend lots of money, great care having been taken to insure that there should be the very best facilities for this.

It seems to be the general impression here that from Germany will come the most systematic efforts to profit by what is to be learned at the Exhibition, some of those who have machinery and tools on exhibition here seeming to think that it is almost sure that any new and valuable features shown by them will be fully understood, and probably more or less used in that country. At the same time Germany herself makes a very creditable exhibit in nearly every department, the exhibit of Krupp, though it is not yet open to the public, being destined to be one of the most attractive features. At the main portal to Machinery Hall are to be seen some specimens of German machine work, among them a pulley which is by estimation about 12 feet diameter and 24 inches face. It is a cast and turned pulley, split, with a double set of arms, and the joint, which is a broken one, instead of being half way between two adjacent pairs of arms, as we usually see it, passes right through the center of the four arms which are parallel with each other, and there are binding bolts not only at the hub and rim but midway of the length of the arms as well. Then too, there are connecting pieces between each pair of arms that are side by side, these being cast solid, and placed about midway between the hub and the rim. They are oval in section like the arms of the pulley, and the joint passes through two of them. It is an excellent example of pulley making, and I have not seen its equal elsewhere.

Fig. 3.

Fig. 4.

During the morning of the 29th, water was for the first time turned into the tank in Machinery Hall, and the pump men grouped about it began to wear a more pleasant expression, for this not only filled the tank, but that "long-felt want," also, and gave them an opportunity to do some pumping, and make something of a display which they at once proceeded to do.

The fact that most of the men who are in charge of engines and dynamos here are quite young men is very noticeable. Most of them are as bright as youthful, though occasionally one is found that is troubled just the least bit with a swelled head, and fails to realize that some of the men who may come around and ask questions about the engines may be the very brightest and best engineers of the country. One of these was answering in a very lofty and dignified, not to say supercilious manner the questions of a very modest and unpretentious old gentleman the other day, and I was much amused by the conversation which I happened to hear. The man in charge did not know, as I did, that he was talking to one of the brightest engineers and mechanics now living—a very prominent manufacturer of steam engines himself—and the result was that he not only showed his general ignorance of steam engineering, but made a very bad impression for himself in a quarter where it would have been well worth his while to have made the very best possible impression. The temptation to be afflicted slightly in the manner indicated is probably pretty strong for a man who is away from home and in charge of important machinery about which all sorts of people are continually asking all sorts of questions, but there are probably few places where it is less appropriate or more disastrous for the afflicted one.

I have just heard from an engineer a story which I have every reason to believe is a true one, and shows how "The best laid schemes o' mice an' men gang aft agley."

There was some fear that the electrical and spring device by which the big Allis engine was to be started, by the pressing of a button by President Cleveland, might fail to work, and as a precaution, boys were stationed at intervals between the speaker's stand and the engine to give the signal by a raising of the arms when the supreme moment arrived, Mr. Reynolds standing at the main throttle to open it at the proper time. But about a minute and a half before the button was pressed, one of the boys, growing tired of waiting, yawned and stretched his arms above his head; the next boy, whose "eye was on the gun," interpreted this as the signal, raised his arms, and the signal passed on to Mr. Reynolds, who promptly opened the throttle and started the engine, supposing, of course, that the electric device had failed to work. Afterward the button was pressed and the small throttle valve opened. So it is not true that President Cleveland started the big engine, but that its designer started it from a signal given by a boy unknown to fame. The starting device, by the way, is nothing but a spiral spring which turns a small sprocket wheel from which a chain runs to a larger sprocket which is on the valve stem. As a well-known engineer remarked upon seeing it, there is nothing mysterious about it, and nothing about it that could not be rigged up by a high school boy in about an hour, yet it is heralded as though it were one of the greatest engineering achievements of the age.

F. J. M.

Jackson Park, May 31.

In an article on tire fractures on German railroads, in the "Transactions" of the *Verein fur Eisenbahnkunde*, Mr. Bork says that in the seven years from 1884 to 1890 the number of breakages amounted to a little more than one-half of one per cent., so that for every hundred axles there was somewhat more than one broken tire. In 1890 alone thirty trains were derailed in Germany as the direct result of tire fractures. Mr. Bork gives the appended table of tire thicknesses and fracture percentages for each thickness as observed on the German lines:—6 cm., .025 per cent.; 5 to 6 cm., .080; 4.4 to 5 cm., .290; 3.5 to 4 cm., .540; 3.4 to 3.5 cm., 1.050; 2.5 to 3 cm., 1.650; 2 to 2.5 cm., 1.850 per cent.

No. 9 Double-cylinder Planer and Smoother.

This machine, of which we give an illustration, is made by J A. Fay & Egan Company, Cincinnati, Ohio. It is a heavy machine, so constructed as to be easy of operation, and to do equally good work on the upper and under surfaces. To accomplish the ends desired, some new features are brought into play in the construction. The frame is cored out and substantially braced, and all necessary parts are planed, so that when bolted together the whole is strong and rigid.

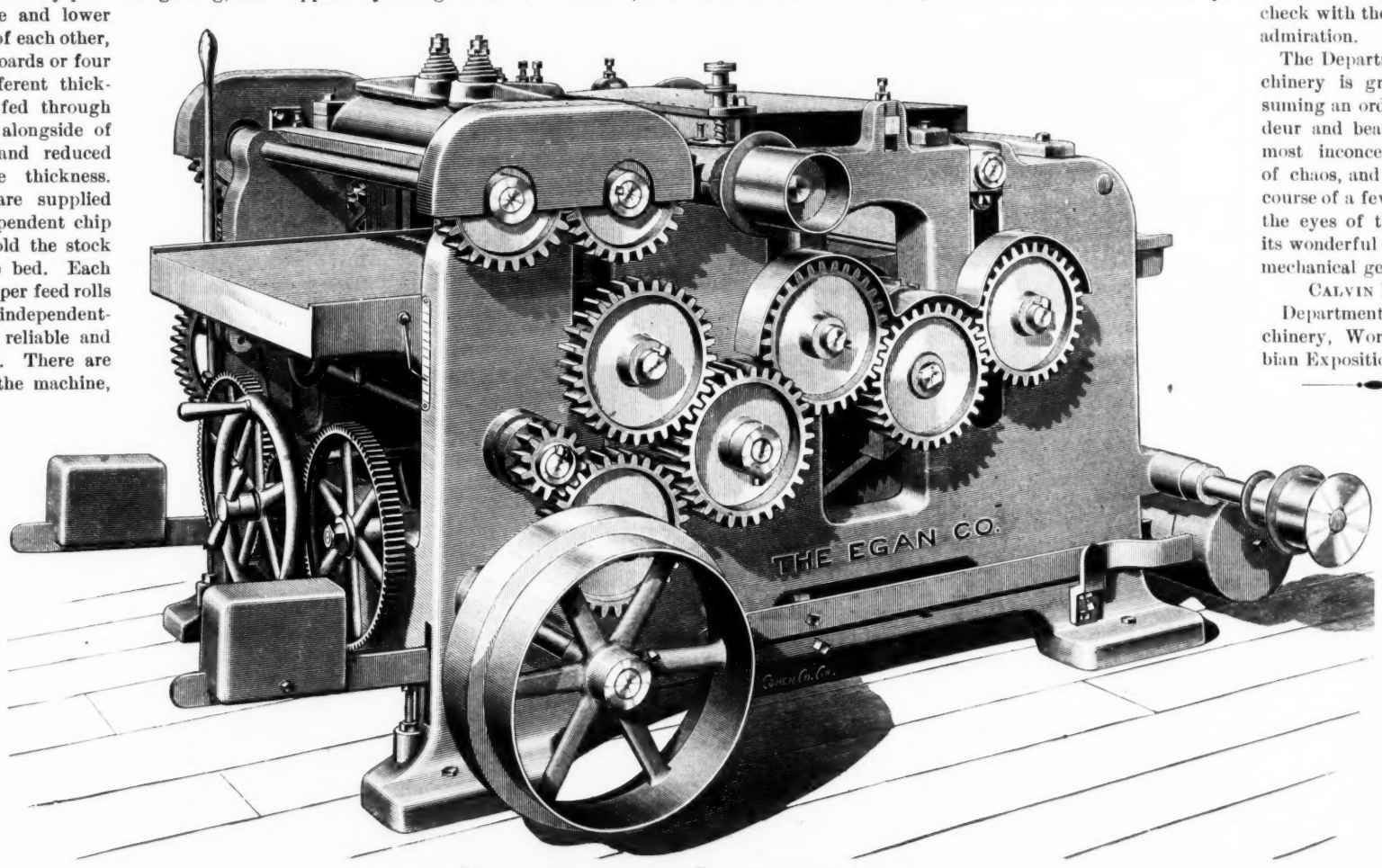
The main bed is fitted to planed ways in the frame, and raised and lowered on inclines by means of two screws, operated by a center pinion and hand-wheel convenient to the operator. An extra adjustment is also provided for raising and lowering the receiving plate of the lower cylinder, so as to change the amount of cut while the stock is being fed through. All adjustments are made from the working end of the machine.

The feed consists of six strongly geared feed rolls of large diameter. The fluted or upper front feed roll is divided into two rolls, each driven by powerful gearing, and made to raise and lower independent of each other, so that two boards or four strips of different thickness can be fed through the machine alongside of each other, and reduced to the same thickness. Both rolls are supplied with an independent chip breaker to hold the stock solidly to the bed. Each end of the upper feed rolls is weighted independently, making a reliable and positive feed. There are two feeds to the machine, controlled by the speed of the main cylinder, so that if the speed of the cylinder slackens up the feed does so too, proportionately. The last pair of feed rolls are placed outside of the lower cylinder.

The cylinders are of solid steel, and four-sided, so that two or four knives may be used on the cylinder as desired. The upper cylinder is belted from both sides of the machine.

Suitable arrangements are made to disconnect the lower cylinder and entire boxing, which can be taken out very quickly when desired. The pressure bars are made to work on the circle of the head, holding the stock down to the bed and close to the knife, thereby preventing tearing out and clipping of ends of boards, and insuring first-class, smooth work, on either hard or soft wood, either straight or cross-grained. One of the advantages, especially in the wider size, is that the stock can be passed diagonally under the cylinder, which is believed to be better than running the cylinder in a diagonal position, as it permits straight belts being run to the cylinder.

This machine is said to be especially adapted to planing straight stock, when straight and cross-grained stock is built up, and is recommended to furniture manufacturers who have stock to dress on one or both sides, and who have wide, hardwood table tops and other glued-up work to plane. It is also recommended for planing-mills, box and carriage factories, and general work, and for piano and organ work which must necessarily be planed exceptionally smooth.



No. 9 Double-cylinder Planer and Smoother.

World's Fair Management.

After reading in your issue of June 1st the item "Columbian Exhibition Notes," I feel that some few statements should be answered by a person familiar enough with the affairs of the Department of Machinery to correct the impressions likely to be received by a stranger not having yet visited the Fair. In an undertaking of so vast a scope, necessitating a large subdivision of labor, with a seeming multiplicity of guiding hands, mistakes are to be expected, petty jealousies cannot be avoided, and friction is inevitable. This enterprise has not been without its share of those three unpleasant features, but taking into consideration the above, in addition to an exceptionally severe winter, followed by a late rainy spring, one might almost say miracles had been wrought.

My principal reason in writing this article is first, to correct the seemingly universal impression that the Department of Machinery has been manipulated for the pecuniary benefit of the stockholders of the Exposition, and to the disadvantage of and with apparently no regard for the exhibitor, and secondly, to place certain so-called arbitrary rulings before the eyes of the machinery world in a clearer and more favorable light.

To begin, the exhibitors in the Department of Machinery represent the leading machine manufacturers of the world. There has been brought together under one roof, not only the wonderful automatic conceptions of our modern inventors, doing work formerly requiring many machines and expert mechanics, but the old standard tools, such as the lathe, planer and drill, greatly improved in mechanical detail, but still doing the same work as of old, although at a greatly reduced expenditure of time and power. These tools are all necessary, and will continue so to the end of time in the manufacture of machinery, and should have their place in this class of exhibits. It has been the earnest endeavor of the chief, Mr. Robinson, to secure a representation of all varieties of machinery required not only in the production of textile fabric and merchandise of all kinds, but of the machine tools used in the production of these very machines. In connection with the above, I wish to say a few words in regard to power, distribution of it, and the charges.

Power is furnished the Exposition free. What does that mean? Simply this; the boilers, engines and pumps are loaned for a period of six months. The firemen, engineers, oilers, and all others connected with the power plant are furnished by the Exposition, together with fuel, no small matter in itself, and all other expenses accompanying an ordinary power plant. In addition to the above fact all the apparatus is new, necessitating additional care and attention, coupled with the fact that the whole plant must be razed to the ground, and dismantled as carefully as it was erected, should convince any fair-minded person that the Department of Machinery has much more expense to incur than an old-established power plant.

In reference to the statement that an exhibitor using free power will not be allowed to show his machinery whenever he chooses, I have a few words of explanation to make. Each different line shaft has its quota of exhibitors utilizing power. Before knowing the amount of power required by exhibitors on that shaft, it was impossible to guarantee them power all the time, or even on demand. It was necessary to wait until all applications for power were in before the amount desired, and the time same would be allowed, could be determined. This branch of the work has been greatly hindered by the delay and neglect of a large majority of the exhibitors themselves. It was impossible to estimate how much power would be required by any set of exhibitors on a line shaft. It was impossible to agree to accommodate them all at one time, or run the risk of overloading an engine at any time by all the power being thrown on the shaft at once. It has been the aim and endeavor to give exhibitors every possible means of making rapid progress, and insuring the complete success of their exhibits. In only two cases has the amount of power applied for by exhibitors on a certain shaft exceeded the capacity of the engine driving it, and in these cases it will be necessary to limit the use of free power to a very slight extent, and to the best interests of all.

In another statement you call attention to the ruling in reference to the belting below the floor. By a decision of the underwriters each exhibitor having counter-shafting under the floor was compelled to inclose it in a fire proof room. This seems to me no more than right, considering the exceedingly inflammable condition of the joists and posts which later on in the summer will become absolutely dangerous from the great heat generated by the immense steam pipes running in every direction. This ruling not only protects the insurance company and the Exposition company, but the exhibitor himself, who has no desire for a fire, and should join hands willingly with the Exposition authorities in guarding against it.

There is but one more statement in your article to which I wish to call attention, and that is the allusion to red tape. In all large institutions, and especially one of such magnitude as this, red tape is bound to crop out, appearing to outsiders absolutely ridiculous, but to one familiar with the immense amount of work necessary to accomplish any systematic result this red tape not only appears wise but absolutely essential. With such an army of clerks and employes, whose work primarily must intermingle, to be finally boiled down to one magnificent record of the whole, everything must be complete, reports must tally, books must compare, and accounts must balance. I wish to say that looking back on the amount of clerical work performed in this vast undertaking, I shall, for my part, always regard the originator of this wonderful system of check and counter-check with the greatest of admiration.

The Department of Machinery is gradually assuming an order of grandeur and beauty out of a most inconceivable state of chaos, and will in the course of a few days draw the eyes of the world to its wonderful collection of mechanical gems.

CALVIN E. PEASE.
Department of Machinery, World's Columbian Exposition.

The torpedo catcher, "Speedy" was recently launched by Thornycroft & Co. for the British navy. Some of her dimensions are: Length, 230 feet between perpendiculars; 242 feet over all; beam, 27 feet; draught, 8 feet 9½ inches; displacement, 810; I. H. P., 4,500; armament, two 4.7 Q. F. guns; four 3-pounders; three torpedo tubes; eight 18-inch torpedoes; complement, 92 men. She was launched with boilers and engines on board.

It appears from English papers that train wrecking, or attempts at train wrecking are not confined to this country. The London *Engineer* says:

"A goods train on the South-Western Railway on Sunday night ran into a large plank which had been placed across the line between Grately and Andover. There have been, within six months, three previous attempts to wreck trains in the neighborhood of Salisbury, and the railway company has offered £100 reward for the detection of the offenders, and time too."

Cessations of labor, accompanied by belligerent tactics, such as those which at the moment are driving Belgian trade in iron and coal to Great Britain and other countries, and checking Hull's career as a seaport to the advantage of other English havens, are, as most people know, not a modern innovation. Strikes occurred centuries ago, and their outcome was just as disastrous as is that of present day work

struggles. In the year 1329 a strike of brass workers was initiated in Breslau, Silesia, which lasted a year. Fifty-six years later, in 1385, one of blacksmiths took place in Danzig, which only ended, but then rather abruptly, when the local authorities obtained permission to issue an edict proclaiming that until further notice any workman refusing to obey the lawful dictates of his employer as to continuing operations was to be summarily deprived of his ears.—*Iron.*

Molding a Condenser.

BY JOSEPH HORNER.

The accompanying figures illustrate the molding of the condenser, the pattern for which I have previously illustrated.

Fig. 1 illustrates the mold in section with the pattern *in situ*, completely rammed up and inclosed in its flasks in readiness for parting and delivery. Some of the subsequent figures illustrate the various stages of this ramming up and molding.

There are five separate box parts in Fig. 1, *A, B, C, D, E;* Fig. 2 shows the first stage of the process. The first stage in the molding consists in laying the part *B* upon the foundry floor, with the joint face, Fig. 1 *b*, lowermost, and placing the portions of the pattern, *F, G, H,* upon a level bed with the joint that runs through the condenser body upon which the joint face *b* rests. Fig. 2 shows that portion of the pattern in *plan*, laid within the box in readiness for ramming. Plates are bolted between flask the sides at *I, K,* to sustain the mass of sand when the flask is turned over presently. A plate *L* is also bolted where shown, see Fig. 1, to afford sustenance to the mass of sand and ashes at *M*, Fig. 1. This mass of sand is unavoidable in consequence of the overhang of the base, molded above, which overhang requires a flask much larger than would be wanted for the condenser body merely. When large masses of sand like this, whether green or dried, occur in molds, it is usual to fill up the central portion with a quantity of cinders as shown at *M*, to assist the due venting of the mold.

After the flask *B* is rammed the drag flask *A*, Fig. 1, is lowered upon it, Fig. 3. The joint at *a* is necessary because the flange *N, N*, with the prints *e, f*, must be left loose from *G, H* for delivery. In the figure the joint of the pattern here coincides exactly with the joint *a* of the flasks. Of course unless flasks are specially made for a job this does not necessarily or often happen; but if the joint of the flange does not coincide with the joint of the flask the sand joint is sleeked with a slope, either downwards or upwards as may be necessary. The ramming of the flask *A* is now done, and the two flasks, cottered together, are turned over bodily into the position which they occupy in Fig. 1 in readiness for flask *C*.

Flask *C* contains the remaining portion *F'* of the condenser body doweled to *F*. Fig. 1 shows the flask *C* and pattern in section, and Fig. 4 shows the flask in plan with the joint face of the pattern *F*, exposed in readiness to receive the portion *F'*. In this middle part there are plates *O* and *P* bolted across the bottom between the sides to carry the mass of sand. Without this precaution the mass of sand would probably fall out on the parting of the flasks along the line *b*, Fig. 1, and the lifting away of *C*. There is also a plate *Q* put across to sustain the mass of sand and ashes at *R*, Fig. 1. A runner is rammed up at *S*, and an ingate at *T*, Fig. 1, the casting being poured at the sides of the flanges, so that the metal does not beat against the core.

On the joint face *C* the flask *D* is laid, and the base of the pattern *U* is laid upon *F'*. This is shown in plan in Fig. 5—compare with Fig. 1. Certain projections on its lower face, as the boss for the pillar, and a portion of the bearings (seen in Fig. 1) have to be bedded in flask *C*, but the bulk of the base *U* comes in the flask *D*.

In this flask also there are plates *V W* bolted across near the ends to sustain the sand; but besides these there are drawback plates *X, Y, Z,* upon which the sand at the sides and in the middle of the base *U U* is lifted away after ramming in order to facilitate the cleaning up and coring up of the mold. Each of these drawback plates is provided with eyes for lifting, and with

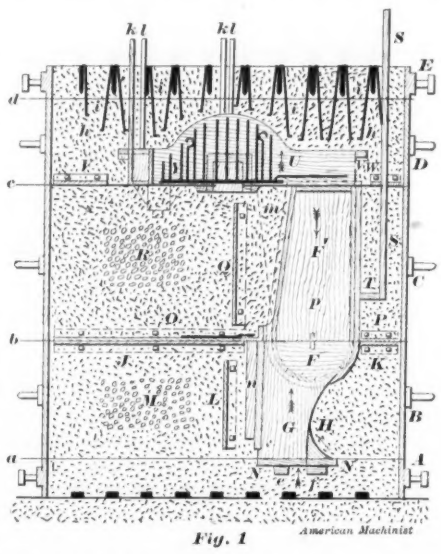


Fig. 1

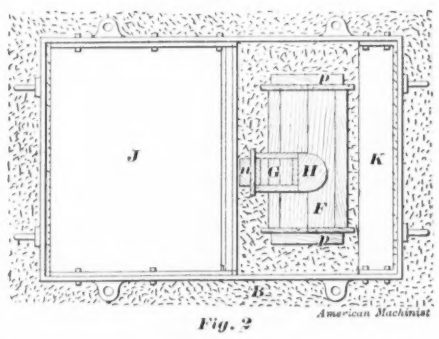


Fig. 2

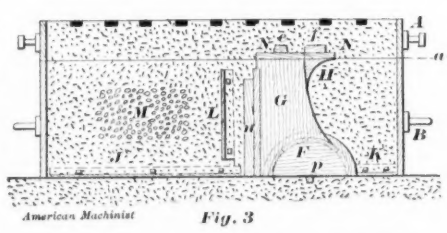


Fig. 3

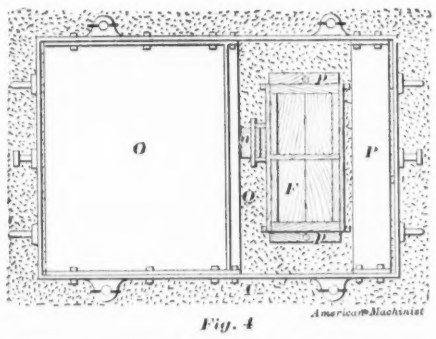


Fig. 4

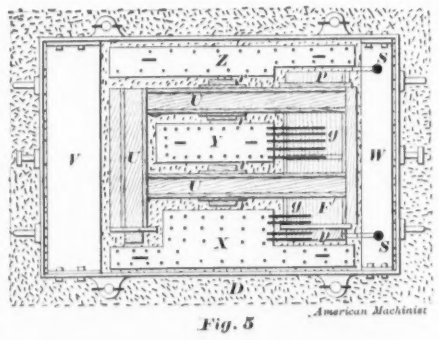


Fig. 5

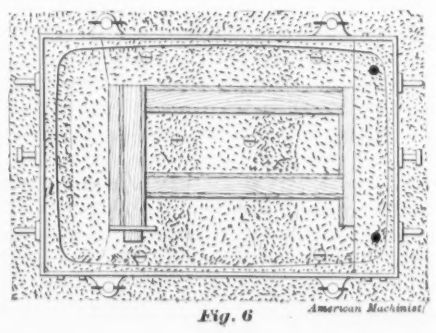


Fig. 6

level with the upper curved contour of the base, and thence sloping sand joints are made to the joint face *d* of the flask, Fig. 1. This is partly indicated by the dotted lines *h* in Fig. 1, and by the darker shading in Fig. 6. The eyes of the drawback plates are seen

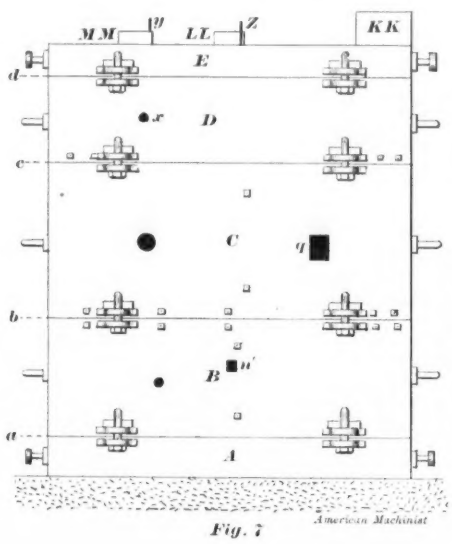


Fig. 7

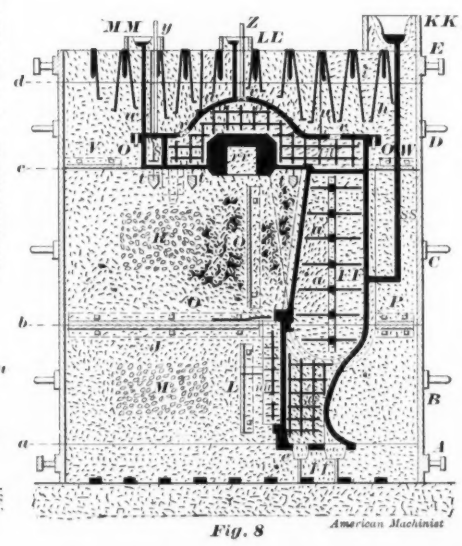


Fig. 8

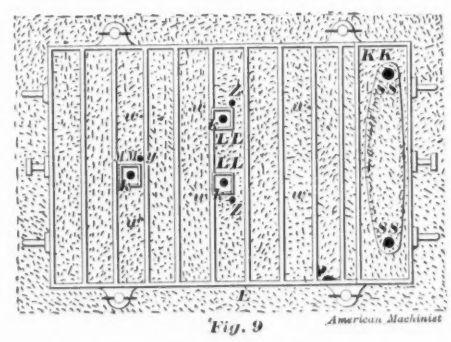


Fig. 9

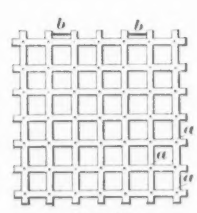


Fig. 10

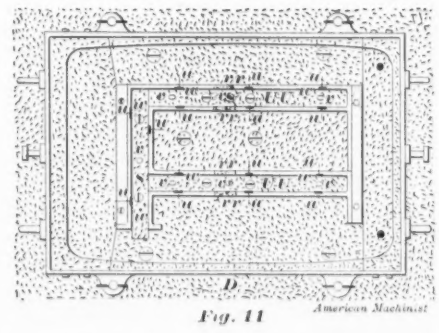


Fig. 11

vertical rods cast in to sustain the sand. There are also horizontal rods, *g*, cast on *X* and *Y* to carry the sand above the condenser body. All these are seen in elevation and plan in Figs. 1 and 5 respectively.

The sand is rammed over the plates about uncovered in Fig. 6, as they must be in order that the drawbacks may be lifted away. They are not fitted up until the molding is completed.

The cope *E* is now put on. Lifters *i*, Fig. 1, are hung plentifully from the bars to assist in sustaining the sand. Riser pins *K* are rammed up in the positions shown, and also small vent pipes *l l* over the positions where the core vents are to be put.

The box parts are now separated and the pattern withdrawn as follows: The cope *E* is lifted off and turned over for cleaning up. No portion of the pattern is left in the cope, but there is only the joint face over the curved top terminal face of the pattern. The portion of the pattern marked *U* is then lifted out vertically in the direction of the arrow. Then the three drawbacks *X, Y, Z* are taken away, and the several parts mended and cleaned up. Flask *C* is next turned over and the pattern part *F'* withdrawn in the direction of its arrow, the bracket, *m*, being drawn afterwards into the space left by *F'*. Afterwards *F G* are lifted vertically as shown by the arrow, and *H* diagonally as seen by its arrow. The flasks are then parted at *a*, and the flange *N N* with its prints *e f* lifted vertically. After the parts of the mold have been all mended up they are put into the stove to be dried.

Figs. 7, 8, 9 illustrate the mold cored up ready for pouring. Fig. 7 is an external view of the flasks, cottered together, with runner and riser cups. Fig. 8 is a vertical section through the mold after pouring, and Fig. 9 is a plan of the cope. We will now take this in detail. The flasks, etc., are similarly lettered in all the figures, so that there will be no difficulty in connecting identical parts with the previous figures. The flasks are put together in the foundry pit in order to bring the pouring basins about on a level with the foundry floor.

First in Fig. 8 the drag *A* is laid down on a level and vented bed, and the small core *f f* is put into its print, the vent being carried down, as shown, into the vented bed. The flask *B* is now put on and cottered to *A*. The core *G G* for the head *G* in Fig. 1 is carried in the print impression *e*, and the vent is brought out at the bottom as shown. It might be brought into the main condenser core, but then there would be risk of metal choking up the vent there, the joint face of the two cores making merely a butt joint without a print impression. When practicable it is always safer to bring a vent away through a print impression than against a surface or butt joint. Cores in print impressions are secured better. Note the grid upon which the core *G G* is rammed up. This is broke up after casting and removed through the condenser body. The core *n n* fits into the print *n* seen in Figs. 1–4. It takes out the recess between the slipper guides. The vent is brought away through the print impression, and out at an opening in the side of the flask, *n'*, in Fig. 7.

The condenser core *F F* is now put into its prints *p p* in Figs. 1–5. It is built on a grid seen in section in Fig. 8, and shown in plan in Fig. 10. It is a lattice work of cast-iron with rods of wrought-iron *a a* cast in all the intersections of the bars. The wrought-iron rods as shown in Fig. 8 are made of such a length as to occupy nearly the entire thickness of the core. Eyes are cast at *b b* for lifting the core into the mold. After the casting is made the core is broken up and the grid drawn out bodily endwise from the condenser.

The flask *C* is now lowered into place over the core *F F*. No chaplets or stays are necessary because the core is sustained at each end throughout its entire depth with the prints *p p*. The vents from the core come out through the box sides at *q*, Fig. 7.

The flask *D* is now put in place, and the drawback plates *X* and *Z*, Fig. 5, carrying their portions of the mold, are put back into the same position which they occupied during the ramming of the pattern. The bearing cores *r r*, Figs. 8 and 11, are then dropped down and slid sideways into those portions of their print impressions which are formed in the sand carried upon *X* and *Z*. Then the middle drawback plate *Y* is lowered into place, and the print impressions formed in that; *r' r'*, in Fig. 5, confine the inner ends of the bearing cores *r r*. The two cores, *U U*, Figs. 8 and 11, are next put in and likewise the end core *S*. With the exception of a single print to carry one end of *S*, see Fig.

11, there are no prints for these cores, and they are therefore carried upon nails or chaplets, and stayed also with chaplets at the sides. Three of the bottom nails are shown in Fig. 8, *f*, and those at the sides in Fig. 11, *u*, the latter being a plan view of the flask *D* with drawbacks and cores *in situ*. These nails being well imbedded and rammed up in the sand cannot move, and therefore the positions of the cores will not be altered during pouring. Further provision is made however to prevent the lifting of the cores. On the main core *U U* three small cores *v*, *v*, *v* are rammed. There are primarily hand holes for the removal of the grid in small fragments after casting, but being made of the same thickness as the top metal they serve the same function as the nails *u* at the sides.

In addition, however, to these there are iron stops, *w*, made to press down upon the cores, and confined from lifting at the top of the cope. The lower ends of the stops rest upon small metal plates let slightly into the top of the cores. The air from the core *S* is brought out at the end where it enters the print, and through the side of the flask at *X* in Fig. 7. A portion is also brought up through the vent pipe *y*. The air from the cores *U U* is brought up through the central small cores *V V*, and out at the vent pipes, *Z*, Figs. 7, 8, 9.

The small cores for the hold-down bolts are shown at *O O*. The pouring basin is shown at *K K*, Figs. 7-9, and the runners at *S S*, Figs. 8-9. The riser cups are shown at *L L* and *M M*, Figs. 7-9. Fig. 9 is a plan of the cope ready for pouring. The lugs and their cotters, the swivels and handles of the flasks, and the shapes of the bars or stays need no comment, being self-explanatory.

Combined Sawing, Boring and Chamfering Machine for Wagon and Carriage Makers.

This machine has been designed especially for wagon makers. It is a small compact machine carrying a 12″ circular saw, having loose or tight pulleys for starting or stopping the entire machine, and friction clutches for running the saw or the chamfering cutter independently.

The saw, the chamfering cutter and the boring bit are all carried on separate arbors, running at proper speeds and not interfering with each other. None of them need to be removed to make room for the others, but when it is desired to cut grooves, the circular saw can be replaced by a dado head. The table is hinged at the back and arranged to swing up and down by means of a screw, to give the saw or the dado head any desired depth of cut.

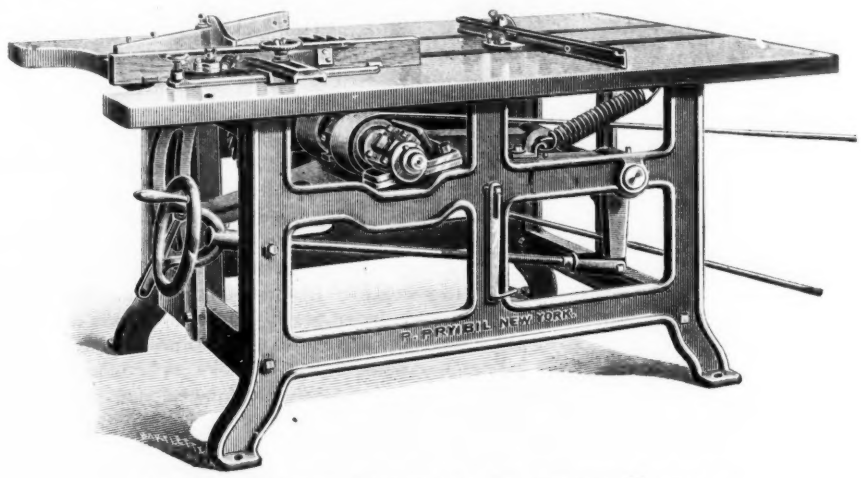
It is provided with a rip-gauge, and with either one or two cross cut slides. The boring table is adjustable vertically by means of a screw, and it slides to and from the bit by the operation of a hand-lever. It is provided with an adjustable stop to limit the depth of hole bored, and with an adjustable fence and gauge to determine the position of the hole. When so ordered, this table can be made to slide sideways also against adjustable stops; this enables two holes to be bored at a predetermined distance apart without removing the work from the table. The chamfering is done by an independent cutter, which can be set to cut any width up to one inch. All bearings and loose pulleys are self oiling; bearing caps are planed in, lined with the best babbitt metal and provided with back pressure screws.

The machine is self-contained on a box-shaped body made in one piece, and not liable to twist out of shape when placed on a weak or uneven floor. A belt shifter is provided which will catch the belt in any direction from which it may come.

Weight, about 700 pounds. Floor space required, 5 feet by 3 feet 2 inches. The tight and loose pulleys are 8 inches diameter for a 3-inch belt, and should make about 765 turns per minute. It is manufactured by P. Pryibil, 498-510 West Forty-first street, New York City.

Three-inch Cutting-off and Centering Lathe.

This lathe, a cut of which is shown, is designed for use in the machine shop and tool room for cutting off and centering stock, notching down for shoulders, cutting off for washers, etc. The bed casting is heavy and strongly webbed, and the plan has been followed of casting the head-stock and as many other parts as is practicable in one piece with the bed, gaining any advantage of strength and rigidity that may be had in this way.



COMBINED SAWING, BORING AND CHAMFERING MACHINE.

The tool-slide has a length of 10 inches, and is 6 inches in width. This gives liberal wearing surface, especially when it is considered that its extreme travel is only 2 inches. The feed screw is ¾″ diameter, and the brass nut in which it works is 3 inches long, and is fitted in a counterbore in the lower part of the slide, which takes the thrust. Automatic feed by means of a worm and tangent wheel is provided, with automatic release at any point.

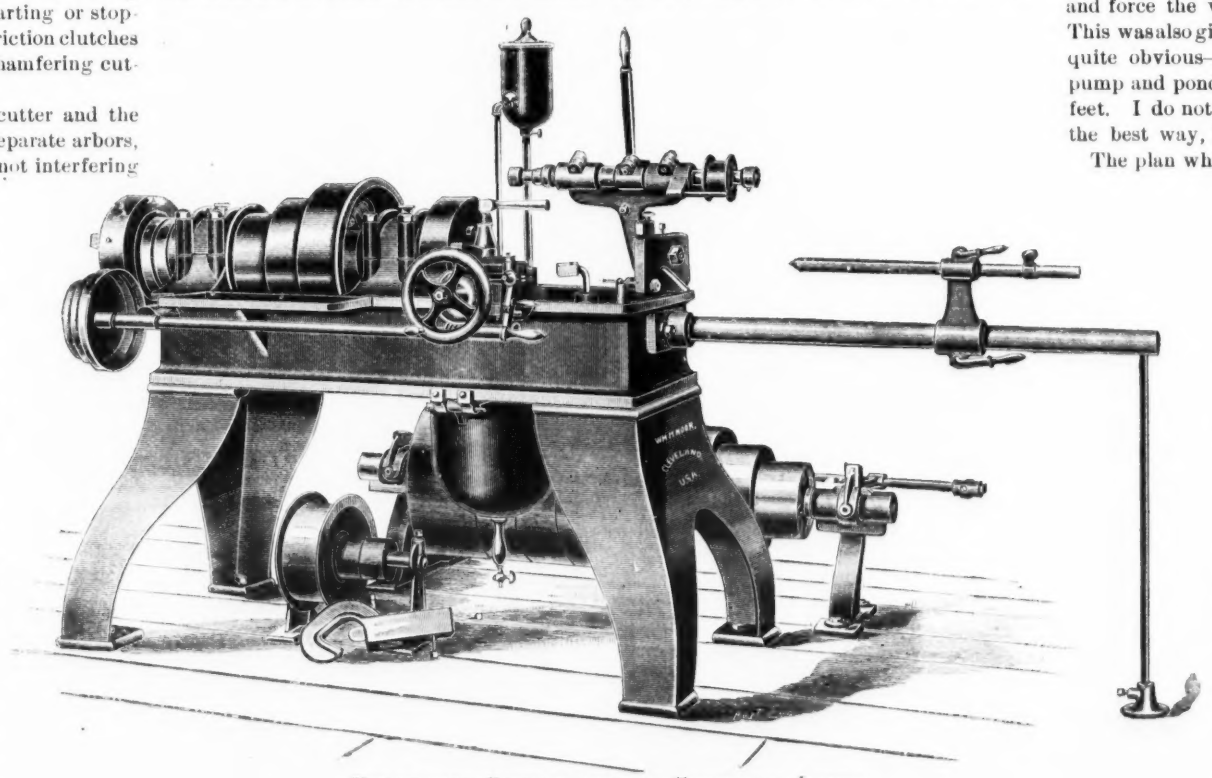
There is a sliding block fitted to T slot in which the tool-post is held, adjustable in line with spindle and with one end so formed as to partly encircle the tool-post with two points for side of tool to abut against. The use of this is to provide for quickly setting the cutting tool in exact line with the feeding movement and at right angles to spindle. By this means the tool may be very quickly adjusted to long bars, which it is difficult to move endwise to a small fraction of an inch. This piece, together with tool-post, plates under tool, latches and pins in feed motion, and all nuts and bolts subject to wear are of steel, hardened.

Especial pains has been taken to make the centering attachment strong and rigid, and at the same time sensitive enough for small drills. A hollow box-section frame carries two bearings for a sliding sleeve, in which the spindle runs on one end, with a counterbalance weight at the opposite end; this swings up and down on an eccentric pin against an angle plate cast with the bed. As shown in the cut, this frame is thrown up to permit rods to pass under for cutting off, but by one movement of the feed lever it may be swung down against an adjustable stop, where it may be fastened if desired, or may be kept down by a slight downward pressure of the hand, while a forward movement feeds the revolving drill or countersink against the work, which revolves with the chuck in an opposite direction.

This gives results in centering that are satisfactory for most work; where great refinement is required, as for turned rods or those accurately drawn or rolled, the rest shown on the floor is used. This is made with three bearings adjustable to any diameter within its range. It may be bolted to slide where the tool-post usually is, and trues the rod at that point, which is centered independently of the chuck nearest the centering spindle, the rod being driven by the other chuck on the main spindle.

For driving the centering spindle a separate countershaft is used, both to give this spindle suitable speed and to center pieces of irregular form, in which case the drill is held in the chuck at outer end of spindle, the gauge rod being pointed to act as a dead center, the supporting rod shown giving sufficient stability for the purpose.

A bracket may be fitted to either rod to hold jigs for drilling small work.



THREE-INCH CUTTING-OFF AND CENTERING LATHE.

The main spindle of machine has a 3⅜-inch hole; the cones are for 4-inch belt. The countershaft has two speeds, giving, with cones, six changes. Oil pots are provided to separate oil and chips, the lower one swinging on hinges to facilitate the emptying of chips.

The manufacturer is Wm. M. Moore, Cleveland, Ohio.

LETTERS FROM PRACTICAL MEN.

Large Siphons.

Editor American Machinist:

Several years ago an electric light plant of my acquaintance ran short of water. The main source of supply consisted of two wells, each about 40 feet deep and perhaps 5 feet in diameter. These in turn were dependent on those traditional "veins" of water, which are popularly supposed to flow in various directions under most interior prairie towns—I wish, by the way, that some systematic study could be made of this matter. I once set some students to work on it. The plan was to collect samples of water from different parts of the town, as many as possible, and see if there was any indication of anything like "veins." In a college pure and simple it is hard to get much done this way for various reasons, but so far as the work went, it looked a little as if there were lines on which wells yielded water of identical chemical composition. To return to the main subject now, the wells, as I said, failed, or rather showed decided signs of failure, and it became necessary to find immediately some other source of supply, a very serious problem in such a town with no river or deep well. At some little distance was a small pond—we should call it a mud hole here—and it was desired to connect with it in some way.

The idea first proposed was to connect the pond with the feed pump at the station, but this was soon given up for obvious reasons—the level of the pond was almost identical with that of the pump. Secondly, it was proposed to put the pump at the pond end and force the water through to the station. This was also given up for reasons which seem quite obvious—when the distance between pump and pond is taken into account, 1,700 feet. I do not say that this was not really the best way, but it was given up anyway.

The plan which was hailed with approval was to *siphon* the water over from the pond to one of the wells at the lighting station. The apparent cheapness of the plan was its salvation. The stockholders decided that it would be necessary to use 2-inch pipe, any-way, no matter what plan was adopted, and the siphon plan would then involve no further expense.

In detail the plan was as follows: The siphon was to be between the pond level and the level of the water in one of the wells, which was 30 feet below the pond level, so the siphon would have a "head" of 30 feet. It was thought that this was abundant head, and forthwith the construction of the siphon was begun. It was 1,700 feet in length with two gentle bends (not elbows) in the pipe, which was 2-inch pipe. As I remember it the highest point in the siphon was at about one-third the total distance from the pond and nearest the pond. At this highest point a pump was placed, whose mission was to fill the pipe when necessary.

The pipe was very well laid, and the trial was, I think, a very fair one. It was unsuccessful. The siphon would run for a short time and then stop. Of course, the flow would slacken and stop anyway after a while, because the *head* is all the time diminishing, but this was never the cause of the stopping. It was mainly air in the pipe. If my memory is correct, there were at-

tempts made to get the air out at the "highest point" where a superficial view of the matter theoretically would lead one to place it. As a matter of fact the air was not in the top of the loop when the siphon was running. It was decidedly ahead of that point. By making a small siphon from glass tube, any one can easily see the philosophy of the thing for himself, and I advise any one who contemplates having anything to do with siphons on a large scale, to spend some time in experimenting with a small glass one. It will be valuable training.

The trial then, in this case, was a failure. The only other case I know of where it was attempted to siphon water under similar or nearly similar conditions was the following:

During the construction of the tunnel through the Blue Ridge in Virginia, Col. Crozet made use of a very large siphon for draining water from the heading. The length of the pipe was 1,792 feet. The pipe was 3 inches diameter, and rose at one point 9 feet above the initial level. The final level was 20 feet below the initial level. No automatic air valve was provided.

This siphon would flow for about two hours and then cease, owing to accumulation of air in the pipe. When in full operation it discharged 43½ gallons per minute. It may easily be calculated that the theoretical discharge from such a sized pipe with the specified head is 55½ gallons per minute.

I doubt very much whether this performance has been duplicated. The case I instanced first was not of the same grade at all. Now, what I would like to know, is whether any one knows anything about large siphons, anyway. Some time ago the AMERICAN MACHINIST secured for us some interesting and valuable data on the performance of injectors, and I think a little siphon history, theory and practice would be of great interest to many.

JOSEPH TORREY.

The Antiquity of the Drop-a-nickel-in-the-slot Machine.

The Philadelphia *Record* says that the original inventor of the nickel in the slot machine is a Philadelphian. Away down on the border line of the Twenty-seventh Ward is an old-fashioned road-house, known as the Union Hotel. It has been a road-house for sixty-three years. Long ago it was kept by old Captain Serrill, who had an inventive son, now a jeweler on South Ninth street. In the old road-house are many ingenious clock-work machines, constructed by young Serrill years ago. Among them is a large hen, so constructed that by dropping a nickel in the slot the hen lays an egg. This, it is claimed, is the first nickel-in-the-slot machine ever constructed, and although it was never patented, all the present inventions were hatched from this old hen.—*New York Tribune.*

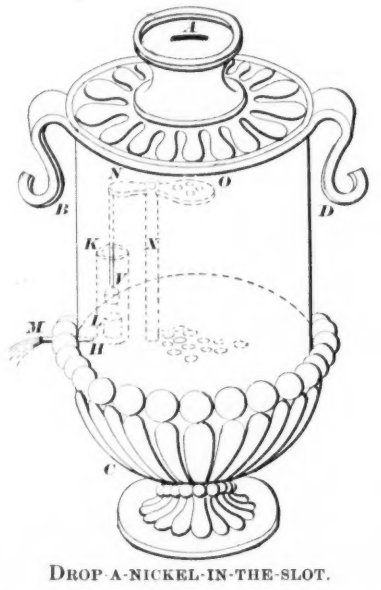
Editor American Machinist:

The above claim made for the nativity of the "drop-a-nickel-in-the-slot" machine must yield to the indisputable facts of history. Mr. Serrill may have invented a mechanical hen, which when fed upon "nickels" would lay "an egg." There is nothing said about the size or quality of the eggs laid by this wonderful bird, but as we are told that it was "a large hen," we naturally incline to the belief that the eggs were also "large," which prompts the suspicion that she may have had something to do with the phenomenal eggs that have been from time to time presented to the editors of rural newspapers, notwithstanding the fact that such eggs have been uniformly described as having been "laid on our table" by some enterprising farmer of the vicinity; and the fact of our never having heard anything about the flavor of such eggs gives emphasis to our suspicion. We are, upon the whole, disposed to think that the *Record* must have been "egged on" to make the claim without due investigation, for, as a matter of fact, the history of the "nickel-in-the-slot machine" commences at a very early period, some years even before the foundations of the "new public buildings" of Philadelphia were laid.

Hero, of Alexandria, who lived about 150 years prior to the year One of the Christian era, gives us in his "Spiritalia" the following description of an apparatus for selling water from "certain sacrificial vessels," but he fails to state how old this machine was, and, therefore, as his is the first account of it, its age and origin are absolutely unknown, but it appears from his description to have been one of the details of temple worship in Egypt two thousand years ago.

Hero says: "If into certain sacrificial vessels a coin of five drachms* be thrown, water shall flow out.

"Let *A B C D* be a sacrificial vessel, having an opening in its mouth *A*; inside of



DROP-A-NICKEL-IN-THE-SLOT.

this vessel let there be a receptacle *K*, for the water, at the bottom of which is a small round box *L*, from which a pipe *L M* passes out of the vessel. Near the receptacle *K* there is placed a post *X*, on the top of which is the fulcrum of the lever *N O*, which is expanded at *O* into a circular plate, while at the end *N* is suspended the valve *V*, which closes the top of the round box *L*, so that no water can flow through the discharge tube *L M*. This valve must be heavier than the plate *O*, but lighter than the plate and coin combined. When the coin is dropped through the slot *A*, it falls upon the plate *O*, which descending lifts the valve *V*, and a small amount of water escapes through the outer end of the discharge pipe at *M*. But as the downward movement of the plate *O* continues the coin will slide off and fall to the bottom of the vessel, and then the valve *V* will descend and close the top of the round box *L*, so that the discharge of water will cease."

From this description by Hero at least two things are evident:

1st. That from the mechanical construction of such "sacrificial vessels" the water which they contained was made very expensive to those who wanted it.

2d. That all the present "drop-a-nickel-in-the-slot" inventions have been hatched from a more ancient "hen" than ever laid eggs in Philadelphia. W. F. DURFEE.

*About 97½ cents of our money.

The Ellipse.

Editor American Machinist:

Constructions for drawing the ellipse may be divided into two classes: (1) those which give curves which approximate closely to a true ellipse, but which are too complicated for practical purposes; and (2) those which are drawn rapidly, but which represent the curve more or less inaccurately.

It is scarcely necessary to say that all methods which include the employment of arcs of circles are defective, but experience proves that arcs judiciously chosen may be drawn which *apparently* coincide with the ellipse, and therefore satisfying the eye of the draftsman, may be accepted in representing the curve.

Having made a number of observations on large ellipses with different proportions of axes, I have devised, and now always employ the following simple construction.

I recommend it because, in drawing the figure in ink, the major part, and, within certain limits, the whole of the curve, is represented by arcs of circles.

By employing arcs, taking the centers on the axes or on the axes produced, symmetry with respect to the axes is maintained, the figure is drawn quickly, and a very small part is traced with the aid of the curve ruler.

Let *a b* and *c d*, Fig. 1, be respectively the major and minor axes of an ellipse intersecting at the center *o*.

Draw two lines *o g* and *o a'*, Fig. 2, forming any angle at *o*. From *o* as a center, with radii equal to the semi-axes *o a* and *o c*, draw the arcs *a a'* and *c c'*. Lay off *a e* equal to one eighth of *a c*. Join *e c'*, and draw *c f* and *a' g* parallel to *e c'*, intersecting *o a'* and *o g* respectively at *f* and *g*.

Lay off *b h*, Fig. 1, equal to *o f*, Fig. 2. From the center *h* draw the arc *m' b m'''*. Lay off *c k*, Fig. 1, equal to *o g*, Fig. 2. From the center *k* draw the arc *l c l'*.

Place the curve ruler in a position tangent to the arcs *c l'* and *b m'*. There is no difficulty in placing the ruler in a position which will fulfill these conditions, and which will at the same time satisfy the eye of the draftsman who is familiar with the ellipse.

We find by inspection that the arc *c l'* may be drawn as far as *l'*, and that the arc *b m'* may be produced to *m'*, leaving *l' m'* to be traced with the aid of the curve ruler, the points *l'* and *m'* being very readily determined by the draftsman in any given case.

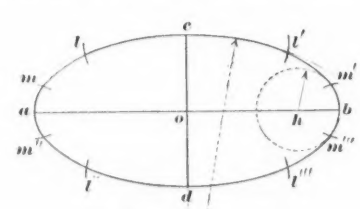


Fig. 1

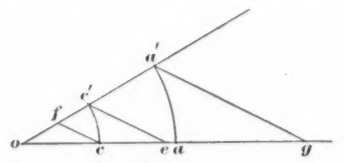


Fig. 2

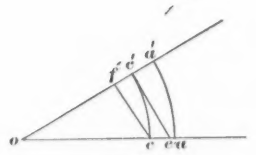


Fig. 4

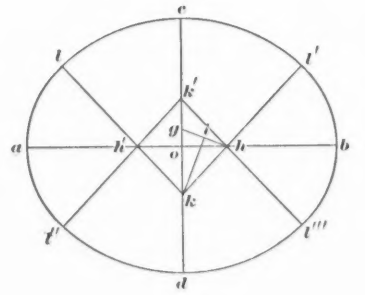


Fig. 3

THE ELLIPSE.

In preparing the curve for inking in, lay off *c l*, *d l''* and *d l'''* equal to *c l'*; also lay off *b m'''*, *a m* and *a m''* equal to *b m'*. The arcs *l l'* and *l'' l'''*, struck with the same radius *k c*, will be limited at the points *l*, *l'*, *l''* and *l'''*; and the arcs *m' m'''* and *m m''*, struck with the same radius *h b*, will be limited at the points *m'*, *m'''*, *m* and *m''*.

The same part of the curve ruler which is employed in drawing the curve *l' m'* should be used in tracing the parts *l m*, *l'' m''* and *l''' m'''*—*i. e.*, the curve from *l'* to *m'* in direction corresponds to the curve from *l* to *m*. Similar remarks apply to the curves *l'' m''* and *l''' m'''*, the lettering of which indicate the direction in which the ruler is to be placed in order that the four parts may be symmetrical with respect to the axes.

When the minor axis is more than three-fourths the length of the major axis, I draw the curve wholly by four arcs, introducing the construction for a four-centered oval. Let *a b* and *c d*, Fig. 3, be the axes. Draw any angle *a o a'*, Fig. 4, and draw the arcs *a a'* and *c c'* with radii equal to the semi-axes, as in Fig. 2. Lay off *a e* equal to one-eighth of *a c*. Join *e c'* and draw *c f* parallel to *e c'*. Lay off *b h* and *c g*, Fig. 3, equal to *o f*, Fig. 4. Join *g h* and bisect it at *i*. Draw *i k* perpendicular to *g h* intersecting *c d* at *k*. Lay off *o h'* equal to *o h*, and *o k'* equal to *o k*. Join *k h*, *k h'*, *k' h* and *k' h'* and produce these lines. From *h* and *h'* as centers, and with a radius equal to *h b*, draw the arcs *l' l''* and *l l'''*. Also from *k* and *k'* as centers, and with a radius *k c*, draw the arcs *l l'* and *l'' l'''*.

New Haven, Conn. F. R. HONEY.

Advantages of a Chucking Department.

Editor American Machinist:

A question was asked some time ago as to the proper speed and feed for reaming. The writer was in hopes some of your numerous readers, familiar with the subject, would answer the inquiry, and his present object is not so much to answer the question, as to invite discussion of an interesting subject. The AMERICAN MACHINIST is a welcome visitor at the workshop. Through its columns the workmen throughout the whole country exchange thoughts with each other on subjects of a practical nature that enter into every-day shop practice; and the inquiry of your correspondent is one of the many that come up every day for solution.

Is it practical to lay down any fixed rule for the operative to guide him in regulating either the speed or the feed of say a 2-inch reamer, or any other size? When the variation of stock to be reamed is taken into account, the conditions that will be best suited for cast-iron may not give a satisfactory result in either steel or brass, and when we come to work bronze or phosphor-bronze, the conditions again change, and the variation in these different metals is no greater than we will find in the different qualities of cast-iron. If the iron is hard a smooth bright surface is secured under fair conditions, while on soft iron, with the same conditions as to quality of tools, speeds, etc., an entirely different result is obtained. With these difficulties to contend with, is not the judgment of the man who does the reaming the safest guide? If he is a man of experience in that line of work he will need no rule but his own judgment based on former results under similar conditions; and in the matter of experience the larger concerns have an advantage over their smaller rivals, inasmuch as they have chucking departments properly equipped with tools for doing that class of work. A chucking department properly fitted out with facilities for doing work is of great advantage, when the work to be done in that line will warrant the expense of the necessary machines and tools. Better work and more uniform sizes are secured, not because the man who does the chucking is smarter than his fellow workmen, but because better facilities are at hand for doing the work than are possible under other conditions.

There is a bushing to make or a pulley to be chucked. The first thing to do is to get a chuck. The back plate fits another fellow's lathe. After that has been changed, and the chuck in place, chuck drills and proper size reamers are found, often after much waste of time. With a well regulated chucking department this time is all saved. The chuck is all ready, the tools are at hand, no matter whether it is one or a hundred pieces, and the mere matter of changing from one size hole to another is but the work of a moment.

But, my friend says, this system of special departments for doing different classes of work is what is ruining the machinist trade, because the apprentice boys do not get a

chance to do so large a variety of work as formerly. This is an assertion we hear quite often in the shop. Is it true? *No;* for they learn what is of far more value to them, and that is system, without which no modern shop, large or small, can compete with its neighbors in the same line of business. The apprentices of to-day don't have to serve the first few months sweeping the floor and cleaning castings, but commence the first day to learn the use of tools and the manner of doing work. What the boy learns in regard to shop management is of far more benefit to him than the lack of the opportunity of doing *scrub work* in the machine shop. He will learn that it is more economical to supply screws made on the screw machine than the ones cut in the lathe; that, in fact, *system* is of great importance in the management of the modern workshop, and is essential to success in this age of competition. D. D. D.

Hints from the Drafting Room.

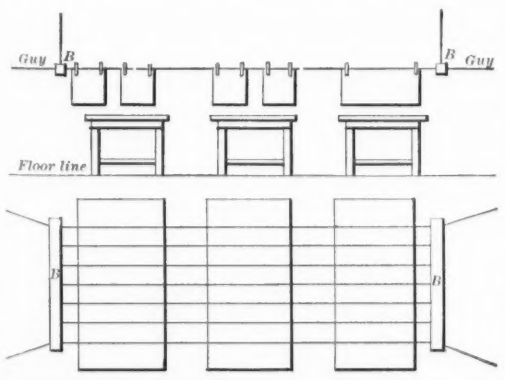
Editor American Machinist:

Thinking a plan or style of working from prints, tracings, or sketches, without the usual craning of necks or other gymnastics, might interest some of your readers, will outline a plan adopted in the drafting room of the Wheelock Engine Co.

The plan was devised by our head draftsman, Mr. Charles H. Jenness, and has proved of great value by its convenience, in the comparatively short time it has been in use.

At first sight it might easily be taken for a clothes-line or lines, or else one of these "cash" systems where the basket containing your money goes sailing away to the cashier's desk, but it isn't either of these. The plan view and side elevation will show the system in detail, which consists simply of a number of wires or strings, stretched tightly between two cross-bars, *B B*, shown in both views. These bars are guyed from the side walls by guy wires and the tension of the strings is made by straining these guy wires as much as desired. The bars are also suspended from the ceiling, which suspension can be made to increase the tension by raising the bars, or merely support the weight of the bars to prevent a sagging due to their weight. These suspension wires also obviate the danger of the bars dropping and doing the "guillotine act" in case the guy wires should break or pull away their fastenings.

The bars are made about 1½ inches square by about 4 feet long and are of soft pine varnished for a finish. The strings or wires are spaced about 3½ or 4 inches apart in our



case and seem about right for ordinary use. We used annealed iron wire of small size (about No. 14 B. & S. gauge) for the guy wires and also for the outside wires of the lines, so as to get what tension we wanted with the guy and side wires, and then use good hemp cord for the inside lines, as they are easier to handle and answer fully as well.

We use light sticks about ¼x¼ inch and the length of the full sheet tracings, and also use spring clothes-pins to fasten the prints, putting the clothes-pin over the cord and clamping the stick and tracing below, leaving the cord loose in the opening of the pin and free to slide along the cord. These are especially valuable when working from other prints, often referring to half a dozen different ones in working out a single drawing, and this keeps them all before you, yet out of your way. Having as many prints as necessary before you, the large ones hung one on each cord and the small ones two on a cord as shown, if desired, you can very easily shift them back and forth so as to expose to view the ones wanted.

It has the still further advantage of enabling the tracing to be shifted from table to table, as wanted by the different men. It will be seen that both ends of the table are served alike, only, of course, they cannot transfer tracings from one end to the other without changing the clamping pins on the wires or cords. Any little improvements that can be introduced help its usefulness, such as having small hooks on the spring clothes-pins for hanging to the cords, thus saving clamping around them. Or the pins can be fastened to the sticks and have hooks on the sticks for the same purpose.

As a time saver and a convenience we have found it extremely useful and can heartily commend its use to any one in a similar position.

We have also been working somewhat in the realm of splitting paper, and have made seme improvements over the methods generally used. The usual method, as is probably known, is to securely fasten the paper to be split between two pieces of glass or strong cloth, then after thoroughly drying the pieces of glass or cloth are pulled apart, splitting the paper and leaving half on each piece.

Soluble glue is usually employed, and then after splitting the pieces are soaked off and pasted in scrap-books or elsewhere. Our method differs only in detail which we think to be important, especially for our purpose, *i. e.*, making duplicates of the clipping we have split, by the blue-print process. Instead of using glass we use tracing cloth and paste the clippings between two pieces, taking care to paste on the dull side of the cloth.

Then after splitting we leave the clipping on the tracing cloth and have our "negative" or "positive" already to put in the blue-print frame and take as many copies as we desire.

The cloth preserves the clipping and can be filed away in the envelope system or otherwise. When very thick paper is used the portion remaining on the tracing cloth may be too thick for printing through with much success, and it is necessary to either scrape the superfluous paper away with an "ink eraser," or split the paper the second time.

This can readily be done by pasting a piece of cloth to the back side of the split paper, and after drying splitting it a second time, again dividing the thickness by two.

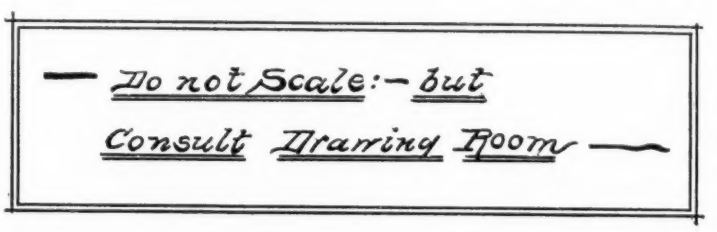
Another method is to use a waterproof varnish for the adhesive, and after thoroughly drying, the paper can be rubbed off very easily by dampening the back, instead of scraping or splitting again. Fine sand-paper can also be used in place of the scraper for removing the superfluous paper, although it must be used carefully, and is hardly as satisfactory as the scraper in resplitting. Where the object is merely to split the paper to preserve both sides in a scrap-book, it can be soaked from the tracing cloth and pasted in, or preserved on the cloth without any scraping or further splitting; but where copies are desired, as is sometimes the case with the plans of an engine "lay out" or similar work that you wish to work from or get ideas from, it is preferable to get blue copies to keep for use. All that is required to do this successfully is to have a good adhesive, thoroughly applied and great care to have the piece to be split thoroughly stuck to the cloth in every spot, then the rest is an easy matter.

We have adopted a method representing sections of metal that saves considerable time over the "cross hatching" generally employed and also makes a neat-looking tracing when nicely done. It is probably not new to many of the readers but will probably be new to some.

It consists simply of using the correct colored pencil on the *back* side of tracing cloth in the places that are shown in section. For cast-iron we use the common soft black lead pencil which produces quite a neat effect on the right side.

For brass a yellow pencil is used, for steel and wrought iron a blue pencil, while for brick walls we use red. These give good effects on tracings and are also shown on blue-prints by the differences in shade, owing to the amount of light which passes through the different colors. These can be applied much quicker than "cross hatching," and makes a neat-looking print.

A good bold title for drawings is to be desired in nearly all cases, especially in looking through a lot to find the one wanted. With this end in view the accompanying alphabet has been adopted for titles of standard drawings as being plain, neat and bold, and at the same time being quite easily learned with a little practice. Unless special accuracy of letters is desired these can be done quite readily free hand after a few trials, and, of course, improves with



practice. In order to break up the bad custom of "scaling" drawings we use the little "motto" shown, which we print on a small piece of tracing cloth and put into the frame so as to come in a prominent position on the print. This brings the injunction before the men as often as they examine a print and will, we hope, help to inaugurate a new state of affairs in this particular. It seems needless to state the objections to scaling a drawing, but the habit is too common in many places to pass without comment.

A *perfect* drawing will have all necessary dimensions on it, and an imperfect drawing should be returned to the drawing-room for correction or completion, whichever may be needed.

Even supposing a drawing to be drawn exactly to scale, the chances are that they will not be scaled exactly alike by different men, unless they scale even inches or halves or quarters; anything finer is apt to be measured incorrectly, according to the man who does it, the angle of his vision compared with the lines of the rule, the stretching of tracing cloth or blue-print paper and other reasons which are not easily overcome in all cases.

Every one who uses tracing cloth knows the great difference between the surfaces of the two sides, and probably the majority use the rough side because the ink "takes" better, and there is no trouble in making the pen flow, while the other side sometimes seems greasy and slippery.

Of course it makes no difference which side we use as far as the tracing or print is concerned, but there are several reasons why it is better and more convenient to use the smooth or glossy side. By simply using a little powdered chalk on the glossy surface before using, the cloth will take the ink nicely and the ink will run more freely from the pen than over the rough surface of the other side, and it works easier after you get used to it.

To use the chalk you can scrape it up fine from a piece of lump chalk and sprinkle over the tracing cloth, then rub in thoroughly with a soft woolen rag, taking care to brush the superfluous chalk away. Or you can powder some and keep it in a "salt shaker" or pepper box, which is much handier than scraping the lump every time. Another advantage in using the glossy side is the comparative ease of erasing ink marks when any change is desired. By using a sharp steel scraper carefully and then using some white soapstone to give a surface to the scratched place, the ink will not run, and if carefully done it is hard to detect the scratched place. The soapstone comes in sticks or pencils and is called a "metal-worker's" pencil. Select the whitest one you can find and you will find it extremely useful. FRED. H. COLVIN.

Worcester, Mass.

Jig Saw For Metals.

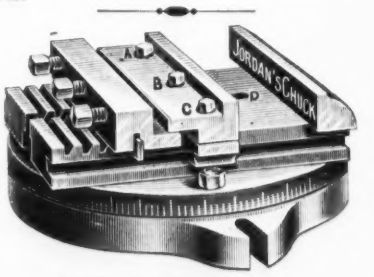
Editor American Machinist:

Noting inquiry of you by "Manufacturing Concern" as to maker of jig saw for metals, would say; that our No. 3 Fleetwood scroll saw is well adapted for sawing of thin metal, and we should be glad to quote your inquirer prices, if we can fill his specifications.

TRUMP BROS. MACHINE CO.
Wilmington, Del.

Battleship "Massachusetts."

By the time that these pages reach our readers the coast line battleship "Massachusetts" will undoubtedly have been launched from the yards of Wm. Cramp & Sons, Philadelphia, Pa. Her length is 348 feet; breadth, 69¼ feet; mean draught, 24 feet; displacement, 10,298 tons. The twin screws will be driven by two vertical, inverted cylinder, direct-acting triple-expansion engines. Diameter of cylinders, 34½, 48, 75 inches; stroke, 42 inches. Indicated horse-power, 9,000. The cooling surface in each condenser (two in number) is 6,353 square feet. Besides this the vessel has an outfit of the Wheeler surface condensers for the auxiliary machinery. Steam will be furnished by four double-ended cylindrical Scotch boilers, each 15 feet diameter and 18 feet long. Each boiler has eight corrugated furnaces 3 feet diameter inside. Grate surface in each boiler, 138 square feet; heating surface, 4,365 square feet. The vessel will also have two auxiliary boilers of the Scotch type; mean diameter, 10 feet; length, 8 feet 6 inches. Each one has two corrugated furnaces, 2 feet 9 inches inside diameter; grate surface, 32 square feet; heating surface, 968.66 square feet. The ship is expected to have a speed of 15 knots.



Jordan's Planer Chuck.

In our issue of January 5, we illustrated this chuck, since when an improvement has been made in what is known as the "Style B," which is shown in the illustration. It consists of a T-slot *D*, in all sizes from 15" to 30" inclusive. The jaw is held down in the center by bolt *B*, and at the ends by gibs which run in grooves and into which bolts *A* and *C* are screwed. It is made by G. W. Jordan, Worcester, Mass.

The net tonnage passing through the Suez Canal was 986,748 less in 1892 than in 1891.

AMERICAN MACHINIST

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J. G. A. MEYER, } Associates.
FRED J. MILLER, }

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☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

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NEW YORK, JUNE 15, 1893

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Headquarters at the Fair.

During the continuance of the Chicago Exposition the AMERICAN MACHINIST will have its headquarters in the space allotted to the Mechanical Press in Machinery Hall. The exact location is Section No. 27, Column K 37. Word can be left with the attendant there by any one who is desirous of meeting a representative of this paper, who may at the time be engaged elsewhere on the grounds.

Why Not Consider the Greathead Tunnel System?

The so called Rapid Transit Commission, of New York City, have been meeting and adjourning for about two years and a half past, and, so far, the net result of their labors appears to have been a scheme for underground transit too preposterously elaborate and expensive to receive consideration at the hands of capitalists.

Following the withdrawal of that scheme—a contingency believed by many to have been foreseen by and not unwelcome to persons influential with the Board—the sessions of the Commission seem to have culminated in a personal squabble over a proposition to turn the city over to the tender mercies of the Manhattan Elevated Railroad Company, for an indefinite period on the one hand, or on the other hand to invite proposals from rival corporations desiring to give the citizens of this strap-hung and noise-maddened metropolis merely some more of the kind of slow transit with which they are already so familiar.

Why wouldn't this be a good time for the Commissioners to stop bandying personalities and give candid and reasonable attention to what is known as the Greathead Tunnel system, referred to and described in our issues of January 8 and 29, 1891. True, it is a very simple system, and there are persons familiar with its history as applied in London, who believe it would be, relatively speaking, an inexpensive and effective method of obtaining real rapid transit in this city. There are not wanting others who believe that these are the very considerations which will prevent this system from ever receiving substantial consideration at the hands of the Commission and those having influence with that body.

Since the above was written four of the five commissioners have resigned, leaving only the single member who is opposed to turning the city over to the existing railway company.

Exhibition Management Not a Profession.

It is especially to be regretted, we think, that the people of Chicago seem to have conceived the idea that the people of the East, and especially those of New York perhaps, are disposed to be unfair in their criticisms of the Exhibition. We think there are very few people indeed, either in New York or elsewhere, who would be pleased to see the Fair turn out a financial failure or be unsuccessful in any way, though there are those who are uncharitable enough to make charges of this kind. And it should be remembered that because a man who visits the Fair does not go into raptures over every feature of it from the Eskimo village to the saw-mill, and from the Ferris wheel to the Lake, he is not necessarily a villain, nor an enemy to Chicago and the Fair.

There has been complaint that the papers, by speaking of the extortion practiced there, and of the incomplete condition of many of the exhibits, have injured the Fair and kept down the attendance. But it should be remembered that most editors think they have a duty to perform for their readers, and aside from this what possible benefit could it be for the papers to ignore these things, let the people go to Chicago and find out about it for themselves, and spread the news? Is it not far better for everybody that the truth should be told, and how else are the readers of papers to believe what they read in them, when they declare, as they will in due time, that the Fair is complete, and that no matter what part of it any one may be especially interested in, he will find that part finished and ready for his study of it? Every good American wants to see the Fair a success in every way, and is going to do what he can to make it so. There are things about it to criticise, but this is true of every exhibition yet held, and probably will be true of every exhibition yet to be held. It is the result largely of the fact that the management of exhibitions is not, and can never become, a business or regular profession. They must in the nature of things be always managed by men who are more or less novices. There are men attending this exhibition in charge of foreign exhibits who have attended so many exhibitions for a similar purpose that they may be considered almost professionals in that line; this being possible in Europe where important exhibitions are much more frequent than here. These men, while many of them grumble at features of our show which displease them, will usually acknowledge that there is about as much to grumble at in all exhibitions, especially at starting; for each country must manage its own exhibitions, "no foreigners need apply," and this single fact entirely prevents the management of exhibitions from being reduced to a science as would be the case if men could devote their lives to it as they may to other callings

The Importance of "First Aid."

There is scarcely a machine shop in the country that does not contain at least one eye specialist. Not a man who can talk learnedly of the various diseases of the eye but one who with keen sight and steady hand rivals the most skilled surgeon in removing small pieces of metal that have imbedded themselves in the eye to the extreme discomfort of the victim, and the endangering of the sight. All those who have had machine shop experience know the utility of the shop eye surgeon, who, by the way, in the experience of the writer is generally more than ordinarily skilled in his regular trade. A recent occurrence in New York leads to the thought that there should also be, in any considerable manufactory, some one who understands thoroughly what to do first in case of such accidents as are likely to occur. It would be a good thing if every one had such knowledge, but this is not the case, and in fact remarkably few possess it. Hence we believe it would be a wise precaution for every proprietor to make a point of knowing that one or more workmen did have the necessary knowledge and skill to enable him or them to act quickly and intelligently in an emergency.

The occurrence in New York to which reference has been made was in the instance of a man who attempted suicide in his house by cutting his wrists, from which cuts he was slowly bleeding to death. According to the accounts of the matter a near by doctor was twice appealed to to save the man's life, but refused because it was a case of attempted suicide. Finally a policeman was called who wasted no time in questions, but promptly improvised one tourniquet from his strap and club, and another from his handkerchief and a convenient poker, and by his promptness and skill saved the man's life. The name of the policeman is Hallahan; we have forgotten the name of the doctor.

Mechanics are not given to attempting suicide—at least not in the shop—but they are liable to accidents from which they may bleed to death, or become badly weakened before a doctor can be summoned, either of which a man possessing the skill of Hallahan might prevent.

The Woman and the Railway.

It seems to be pretty well settled in this country that if a railway company by any means whatever gets its tracks down in any coveted locality it will keep them down in spite of all law and justice. It is of almost daily occurrence that such a company finds itself opposed by force in laying tracks without proper authority, in some city, but persisting in its efforts, laying again at night the rails torn up during the day, finally succeeds in holding the ground. It is such acts as this on the part of railway companies, this defiance of law when it does not suit them, and the failure on the part of the proper authorities to enforce the law, that promotes and sustains the general howl that goes up from the people against such corporations. There is a very general feeling that they are, to all intents and purposes, somehow above the law to the commands of which individuals are amenable.

A case in point recently occurred in Rochester. A railway company in its provisions for reaching some park passed through the grounds of an individual, cutting off for the purpose a part of the stoop of the house, leaving no way of egress except by stepping directly on the track. An injunction was obtained, the company being allowed some months in which to move its tracks. Of course, it did nothing of the kind, so eventually the lady of the house procured the erection of a rather formidable barricade across the tracks, and stationing herself in a part of the house overlooking the approaches, armed with a revolver, awaited developments. Soon a gang of workmen, headed by one of the officials of the road, appeared on the scene to remove the obstruction. The posse paused upon her threatening to open upon them with her revolver, and ingloriously retreated, when she was heard calling upon some one in another room to bring her the shotgun. Just how the matter was settled, if it is settled, we do not know, nor does it matter much, but in any event admiration will naturally be felt for the woman who handled her forces so skillfully and successfully against great numerical superiority. It does not matter much what the end was. It is the fact that individuals must resort to some such means as this woman did to protect themselves, that is the shame. So long as this is so railway corporations will find themselves opposed by the people.

The playground of the workingmen and women and the children of New York has again been saved, from what would doubtless have resulted in a good deal of damage to the grounds and shrubbery, by the strong protests of the people against a military parade in the park. The trouble, not to say disgrace of it, is that such protests are necessary to protect the park from something of the sort. They must be getting rather monotonous. It would appear to be a simpler plan, and one more satisfactory in every way, to elect city officials who are not so willing to permit the destruction of the park—officials who believe that the common people have some rights in the matter.

The hollow piston, the possibilities for deadly work of which have so often been exposed in the AMERICAN MACHINIST during the past ten years, still finds its victims. This time it was in a railroad shop in Chattanooga. The piston rod had been bent and was heated to straighten it. Of course, the piston became heated, the result being an explosion that killed a blacksmith and his helper, and dangerously wounded another man. It would seem that the only way to avoid such foolish accidents is to suspend a placard near every blacksmith fire bearing a legend to the effect that hollow pistons are very likely to be found loaded.

Literary Notes.

The Modern Traveling Crane is the title of a reprint of a paper read by Alexander Outerbridge, Jr., before the Franklin Institute. It makes a very interesting book, describing more especially the Sellers crane, but entering into the discussion of traveling cranes in general in a way that will not fail to interest the reader. It is published by William Sellers & Co., Philadelphia, Pa., and sent free on application.

The Canadian Engineer is a new monthly paper devoted to mechanical and trade matters, published at Toronto and Montreal, Canada. The expressed aim of the publishers is to give such news as comes within its scope relating to manufacture and engineering in Canada. The initial number presents a very creditable appearance.

QUESTIONS AND ANSWERS.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(289) A. V. P., Manitowoc, Wis., writes: Please give dates of your issues containing articles relating to tool chests. *A.*—April 16, May 7, 14, 28, June 11, July 2, 1891.

(290) H. R., Trenton, N. J., writes: I have heard the U. S. Government has purchased a secret for tempering steel tools; it is a chemical composition. Do you know the ingredients and mode of using it? *A.*—We have not heard of such a transaction; and even if such had taken place, it is not likely that the *secret* would be given away.

(291) H. R. M., Williamsport, Ia., writes: I am a pattern maker by trade, and I have a job of making a set of globe valve patterns. Now what I want to know is what you consider the best mode of making the core boxes. I have several ideas, but they are not as simple as I think they can be made. *A.*—See our issues of August 25, September 8, and November 17, 1888.

(292) M. M., New Brunswick, N. J., writes: Please tell me how much slack the brasses of the side rods of a locomotive should have on its pins. *A.*—The brasses should be fitted so that when the rod with the brasses is placed on the pins, and keyed, and the engine is hot, the rod can just be moved by hand along the pins. 2. Where can I get a course of readings on electricity and drawing? *A.*—Apply to Rutgers College in your city. 3. When and where was the first steam fog horn built? *A.*—We do not know.

(293) W. T. S. B., Montreal, Canada, writes: Kindly inform me where I can obtain sample specifications with or without plans, in book form or otherwise, of engines, boilers, and particularly those pertaining to the erection of complete plants. *A.*—We do not know of any book which contains the above information. We are inclined to believe that such a book has not been published. Any good mechanical engineer who has had experience in this class of work will undoubtedly furnish you with a set of specifications.

(294) H. C. S., Middletown, Conn., asks: How many pounds pressure will a Norway iron ring, $9\frac{31}{32}$ inside diameter, $10\frac{3}{8}$ outside diameter, and $1\frac{1}{4}$ inches long, exert on a shaft 10 inches diameter after the ring has been shrunk on the shaft? *A.*—This cannot be answered with any great degree of exactness, because the pressure will depend on the quality of the iron, which may vary considerably for the same kind of iron. A pressure of two tons per square inch is probably a fair approximation. In our opinion, the allowance for shrinkage is too great, which will cause the ring to be heated to a temperature interfering with the laws of elasticity.

(295) W. A. B., Buffalo, N. Y., writes: Supposing I have a pump that will discharge 100 gallons a minute and throw it 100 feet high. The piston speed is 100 feet per minute, and the steam pressure 100 pounds, throttle valve wide open. At what height will the same pump throw the water when running with a piston speed of 75 feet per minute, and discharging 75 gallons per minute? Please give formula. *A.*—The height to which the water will be thrown will vary under the given conditions as the square of the piston speed. The square of 100 is 10,000, and the square of 75 is 5,625, hence we have,

$$10{,}000 : 5{,}625 :: 100 : x.$$

This gives a value of 56.25 feet for x, which is the height to which the water will be thrown with a piston speed of 75 feet per minute.

(296) J. H. F., Baltimore, Md., writes: I am engaged on some experimental work. I have in mind a submarine boat, whose model is 6 inches diameter and 30 inches long. It is to be made of extra heavy tin; the ends of the model are shaped like the pointed end of a cigar. What I wish to know is, what size propeller should be used for it, and at what speed should it be run? *A.*—We should use a propeller 3 inches diameter, and about $5\frac{1}{2}$ inches pitch; speed about 400 revolutions per minute. 2. I have thought of using a small electric motor with storage battery, but I find that its speed will be too high to couple direct to propeller shaft, and the use of gearing or belting is undesirable as well as impracticable. What I want is a power as light and compact as possible consistent with strength, and to have an endurance of not less than 30 minutes, and which can be made accessible by small screw-plates on top of boat. What kind of motor should I use? *A.*—We should endeavor to design a spring motor.

(297) C. F. L., Rochester, N. Y., writes: I find in an arithmetic published in 1883 the following:

504,	127,	364,	549.
Billion	Million	Thousand	Hundred

Is this correct? If not, please write one billion. *A.*—In the United States and France, one billion is equal to one thousand millions. In Great Britain a million of millions is equal to one billion. According to the United States and French system of numeration the above is correct; but according to the system of Great Britain a billion would be expressed thus: 1,000,000,000,000. Formerly it was the custom of pointing off numbers in groups of six figures, but in the seventeenth century the custom prevailed of pointing off numbers in groups of three figures, and this led to the change in the meaning of the word *billion*.

(298) J. B., Wakefield, Mass., writes: Please inform me of the meaning of the term "cross-section" as applied in mechanics. This term is frequently found in mechanics, and also in reference to boiler plates. I have asked the men in the shop, but they don't know. *A.*—This term means a section of something made by a plane passed through at right angles to one of its axes, especially to its longest axis. This term is not often applied to boiler *plates*, but when it is so applied we should take it to mean a section made by passing through it a plane perpendicular to its surfaces, and extending across the width of the plate. The term is applied more frequently to the whole boiler, for instance, the cross-section of a boiler means the section made by a plane passed through it perpendicular to its length. In making a drawing of such a section everything that this plane cuts,, or is supposed to cut, must be clearly shown, and the surface due to the cut must be section lined. By term "plane" is meant a perfect straight surface, that is, something which has length and breadth, but no thickness.

(299) W. W. L., Amsterdam, N. Y., writes: I am a machinist of about 16 years' experience, and a general workman in a shop. I want to fit myself to be able to take charge of an electric plant, and be able to keep dynamos in order. Will it be necessary for me to take a course in a college? Or could a man fit himself for the position by getting a job for six months or a year in a shop where dynamos are manufactured? If it is necessary to take a course in college, what will it cost, and how long will it take to complete the course? Could a person arrange it to take a term at night, so as not to interfere with his work during the day? *A.*—In working in a shop where dynamos are made, you will gain a practical experience which you cannot obtain in a college, and which is indispensable in taking charge of a plant. Then, by studying during your leisure hours so as to gain a theoretical knowledge of the subject, we do not see what should prevent you from becoming competent to take charge of a plant. But if you should take a course in a college, your progress will be much quicker, and more satisfactory, and you will be the gainer in the end. Our advice is go to college if you possibly can, and get the practical experience also. In answer to Question 239 in our issue of June 2, 1892, you will find a number of technical institutions named; write to any or all of them, stating your desire; they will undoubtedly give you good advice, and all the information you need for determining your future line of action.

(300) J. C. B., Fond du Lac, Wis., writes: Kindly inform me how to determine the size of steam and exhaust ports for a given size of a Corliss engine. *A.*—The steam ports are generally made $\frac{1}{14}$ to $\frac{1}{15}$ of the area of the piston, and the exhaust ports $\frac{1}{10}$ of the piston area. If the piston speed is greater than 600 feet per minute, we should find the exhaust port area by the same rule as is employed for finding the area of a steam port for slide-valve engines, namely: Multiply the piston speed in feet per minute by the square of the diameter of the cylinder in inches, and divide this product by 7,639, the result will be the area in square inches of the exhaust port; multiply this area by .7, and the result will be the area of the steam port. 2. How are the diameters of the valve seats found? *A.*—These diameters are found by a drawing-board process. After the areas of the steam and exhaust ports have been found, and the width and length of ports established, such diameters are chosen as will give sufficient area for the steam to pass from cylinder to the steam chests and allow the valves to perform their functions of distributing the steam. For a guidance it may be said that the diameter of the steam valve seat and that of the exhaust valve seat are generally equal, and that the exhaust valve bears on one half the circumference of the seat, sometimes a little less. Expertness in laying out Corliss valve gears can be obtained only by experience and good judgment in designing. 3. How is the size of the dash pot determined? *A.*—See answer to Question 421 in our issue of October 6, 1892.

(301) H. M. J., Chicago, Ill., asks: Please inform me as to the following: 1. In tubular boilers what do you consider to be the best ratio of heating surface to grate area for anthracite coal, for good bituminous coal, and for wood? *A.*—For all of these we should allow about 30 square feet of heating surface to 1 square foot of grate surface, although for anthracite coal this ratio may be somewhat reduced, because the depth of hard coal fires is less than that of soft coal fires, and in order to evaporate the same amount of water with a given amount of coal in both cases, the grate area for anthracite coal burners must be increased, which will allow a slight decrease in the ratio of heating to grate surface. 2. What is the best ratio of total tube area to grate area? *A.*—The total tube area should be about $\frac{1}{3}$ of the grate area. 3 How many square feet grate surface should be allowed per nominal horse-power? *A.*—The term nominal horse-power has no meaning, and, therefore, cannot be used for proportioning the grate surface; the latter depends on the kind and quality of fuel to be used. 4. With good natural draught, how much anthracite coal, and how much bituminous coal should be burned per hour per square foot of grate surface? *A.*—Of anthracite coal, about 12 pounds; of bituminous coal, about 16 pounds; these quantities refer to the average quality of coal. 5. How much water should be evaporated per pound of anthracite, and how much per pound of bituminous coal? *A.*—Since both kinds of coal contain nearly the same units of heat, each kind should evaporate about 10 pounds of water per pound of coal with ordinary firing. 6 What percentage in area would you make that of the smoke flue exceed the total tube area? *A.*—That depends on the size of boiler; generally for large boilers the area of smoke flue does not exceed that of the tubes; for smaller boilers it is usually a little greater. These areas can be found by the table of chimney proportions given in our issue of April 23, 1887. 7. Please define the term "specific volume of steam." *A.*—By specific volume is meant the volume of one unit weight of steam (one pound or one kilogram), for a given temperature and pressure.

(302) A. B., ——, asks: What is meant by the terms "modulus of elasticity," and "coefficient of elasticity," as used in books treating on the strength of materials? *A.*—Both terms mean the same thing. Elasticity is the name given to the property which most materials have, to a certain extent, of regaining their original form when the external forces are removed. Up to a certain limit, called the elastic limit, experiments have shown that the elongation of a bar of any material subjected to a tensile force is approximately proportional to that force. The same law holds good when the bar is subjected to a compressive force. Now the modulus of elasticity for tension or compression is the number obtained by dividing the stress per unit of cross-sectional area by the corresponding relative increase or decrease of length. It is customary to take one square inch for the unit of area, and the stress in pounds; hence, to find the stress per square inch, we simply divide the external force in pounds acting on the bar by the cross-sectional area of the bar in square inches; or in symbols $S = \frac{P}{A}$, in which S denotes the stress per square inch, P the external force in pounds, and A the area of the section in square inches. The increase or decrease of the length must be taken per unit of length of the bar; if the total change of length is given in inches we must divide this by the length of the bar in inches; or, if the change of length is given in feet, we must divide this by the length of the bar in feet; the result will be the increase or the decrease per unit of length, according as the bar is subjected to tensile or compressive force. In symbols we have $e = \frac{c}{l}$, in which e denotes the change of length per unit of length of the bar, c the total change of length, and l the original length of bar. If now we denote the modulus of elasticity by E, we have according to its definition

$$E = \frac{P}{A} \div \frac{c}{l},$$

which reduces to

$$E = \frac{P \times l}{A \times c} \qquad (a)$$

To show the application of the formula, we will take the following example. A bar of wrought-iron was subjected to a tension of 5,000 pounds; its cross-sectional area is .5 square inch; its original length, 6 feet; during tension it was found that its total length was 6.002 feet; find its modulus of elasticity. Here we have $P = 5{,}000$, $A = .5$ inch, $l = 6$ feet, and $c = .002$ foot. Substituting for the symbols in formula a their values, we have

$$E = \frac{5{,}000 \times 6}{.5 \times .002} = 30{,}000{,}000 \text{ pounds}$$

per square inch. This is modulus of elasticity of wrought-iron in tension; the modulus for compression is found in precisely the same way.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Grant's gears, Lex'n, Mass., & Phila., Pa. See p. 11.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Ideal Drawing Stands. M. C. Hammett, Troy, N.Y.

Forming Lathes Mer. Mach. Tool Co., Meriden, Ct.

Air Hoists, Frank Richards, Box 3686, N. Y.

Milling Machs. Kempsmith M. T. Co., Mil., Wis.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

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Drill Presses, with Tapping Attachments.
Gould & Eberhardt, Newark, N. J.

Davis Key Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty St, N. Y.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N.Y.

Pulley lathes, most efficient offered. The Lodge & Shipley Machine Tool Co., Cincinnati, O.

For Cypress Tanks and Vats, address W. E. Caldwell Co., Floyd and Main Streets, Louisville, Ky.

$5 gauge shows speed and all changes of eng's, mach'y, etc. G. T. McL. & Co., 120 Fulton St., Boston.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

"Shapers (Double Triple Quick Stroke")
Trade Mark.
Gould & Eberhardt, Newark, N. J.

For the Latest Improved Diamond Prospecting Drill address the M. C. Bullock Mfg. Co., corner Canal and Washington Sts., Chicago, Ill.

Gear and Rack Cutting, Drawings for Bevel & Miter Gears, Cutters for Spur & Bevel Gears. Milling Cutt's, Vert'l Mill'g Mach's. R.M.Clough, Tolland, Ct.

"Pumping Machinery." New book, 450 pp, 8vo, 270 Eng. Prospectus free. W. M. Barr, 3223 Powelton Avenue, Philadelphia, Pa.

Builders Iron Foundry, Providence, R. I., Mortar Mounting, and 2 — 12" B. L. Rifled Mortars in front Govt Bldg., Chicago. Pamphlets on application.

See the new "Challenge" Water Tool Grinder before you buy. Just out. Appleton Manufacturing Co., Philadelphia, Pa.

Gear Cutters, Auto. Specially adapted for Motor Gears and all other style Gears.
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Passaic Art Casting Co., 35 Warren St., N. Y. Finest Castings in the world. Brass, German Silver, Aluminum, etc. Patent Pressure Process. Machinery Name Plates.

Patent Soliciting of High Class.
D. Walter Brown, Counsel in Patent Cases,
111 Broadway, New York.
Send for Brief History of Patent Legislation.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

"Binders" for the AMERICAN MACHINIST. Two styles the "Common Sense," as heretofore sold by us and mailed to any address at $1 00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold toe entire 52 issues of any volume. AMERICAN MACHINIST PUBLISHING CO., 203 Broadway, New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

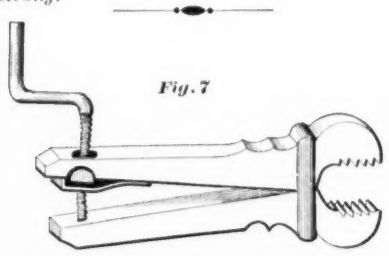
American Tools.

The manufacture of tools in the United States bids fair to surpass that of all other countries, including even England. The American implement is lighter, handier, and is usually made of better material than has been hitherto employed in Europe. The Americans have excellent iron and unequaled wood. (Hickory hammer handles!) The American tool manufacturers appear to have entirely abandoned European traditions, and to have struck out an entirely new path for themselves; hammers, augurs,

files, sharpening and cutting tools, axes, saws, spades, screws, nails, etc., even the handles of implements, appear to have received quite new forms. In the same way the genius of the American, extremely careful to save all unnecessary labor, uses cast-iron far more than it is employed in Europe. A great many machines and parts of tools that we make of wrought-iron are there obtained in excellent quality by casting. This has the important advantage that if a part of a machine is broken or worn, another exactly similar can be procured by sending to the factory its catalogue number.

The American always endeavors as far as possible to economize labor. The blacksmith gets along without the man whom we consider absolutely necessary to hold the horse's leg. There is contained in every American an inventor, a mechanic, or an architect. It is marvelous with what simple means they can succeed. As an example of the practical common sense of the Americans, we may instance the following: The mason, who with us considers the cutting hammer an indispensable implement, does not regard it a separate tool in America; there the trowel is made of hardened steel, and so shaped that it is used to cut and break bricks in bricklaying. When one thinks of the time that is lost in changing tools during the construction of a small house, he can see that this makes an important economy. The woodman, for another example, uses the axe far more than the saw, notwithstanding the danger which it involves. The Americans are as extravagant with materials as they are economical with labor, and for this reason the repairing of tools and implements plays a less important role than with us.—*Frankfurter Zeitung.*

Fig. 7

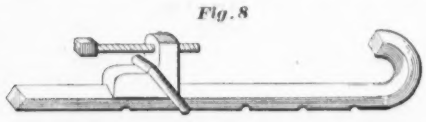


Handy Tools and Appliances—III.

BY PETER H. BULLOCK.

Figure 7 shows a pair of very powerful gripping tongs that are used to draw and hold flanges together while adjusting the bolts, or to hold a new fitting in place while marking the holes from the fitting to which it is to be connected. It will sometimes happen that a cylinder head or steam chest stud or nut will strip its thread or break, and in such a case this grip can be used, doing away with the danger of running with a broken bolt or the possible delay in getting a new one. There is hardly an end to the various uses this tool can be put to around a steam plant. With a longer link and screw they can be made to take in most any width between the jaws. For holding a patch in place while being fitted around the bottom of an upright boiler, I found two pairs, arranged to open about four inches, very convenient to use. These can be made of any desired size, but for ordinary flange work 1¼" square steel, upset at the jaws and drawn somewhat tapered in the shank, is about right. For this size the

Fig. 8



link should be made of ⅝" round machine steel and there can be one, two or three channels swaged across the back of the jaws for it to rest in when the grip is being used for things of different thicknesses.

The tool shown in Fig. 8 is for a somewhat similar purpose as Fig. 7. The bar can be any desired length, but in all cases should be long enough to go from one cylinder head to the other, for very often there is no chance to adjust the grip tongs, and in such cases this tool just fills the bill. The square steel of which this is made is turned around U-shaped at one end, and is bent corner-wise of the bar. This affords a good V-shaped seat for the sliding screw block on top, and a good chance to cut the notches in the bottom edge for holding the link at any desired position not within range of the screw. A friend of mine has two, seven feet long each, and on one occasion he used them on a length of cast-iron steam pipe that had cracked around just behind the flange, and by this means kept the plant running while bolts long enough to span the length were being made, and they in turn did duty until a new piece was secured, fitted and put in place.

Probably most of my readers are entirely familiar with the most approved means of getting a piston rod out of its crosshead, but there are those who are not, and to such this is addressed.

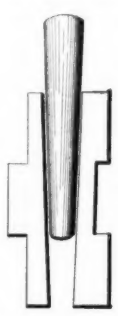


Fig. 9

Much time has been wasted and a good deal of damage done by hammering, twisting, and other ill directed efforts in this direction. The piston rod is usually a taper fit, and is held into the crosshead by either a key or nut. It is almost a mechanical law that all processes can be reversed, and it therefore follows that the same means that are employed to hold the rod in its place can be manipulated so as to force it out. If the rod is held in place by a key, of course the slot in it will be a little longer than in the crosshead, so that as the key is driven the rod will be drawn in still tighter. Now to force the rod out it is only necessary to reverse the conditions and drive the key as before. This is done by introducing the pieces shown in Fig. 9, the notched piece in the end of the slot toward the pin and the piece with raised center towards the piston, and then driving a wedge-shaped key between them. The raised part of one piece enters the end of the slot in piston rod, the ends of it having clearance in the crosshead, and the notched piece is put into the other end of the slot, the wide ends coming against the crosshead, and the notch allows the short end of the rod to move as the key is driven between them. If the rod is held in place by a nut it is usually directly behind the crosshead pin, and there can be a piece of babbitt metal, a nut or pipe coupling placed between them in such a manner that when the nut is turned backwards the rod will be forced out the same as by the key and liner pieces.

If it becomes necessary to remove a flange coupling from a shaft, the same ideas can be employed if you do not happen to have a coupling press or other suitable methods, except hammering. And I wish to say right here that I do not believe that a coupling can be driven off and on again by severe hammering without injury to it or to the way it will run afterwards. A coupling may be started and removed by means of the regular coupling bolts, as follows: Loosen all the nuts so the flanges can be pulled apart as far as possible, leaving about three-quarters of each nut on the ends of the bolts, then introduce a piece of flat iron larger than the end of the shaft and on the side you do not want to start, and a nut or other piece of iron against the end of the shaft you do want to start, and then tighten up the bolts until you have forced out the shaft the thickness of the smaller piece. This can then be repeated, using a thicker piece each time. In this way you can remove a coupling without any battering or danger of getting the fitted end out of truth. I have often spoken of the importance of keeping a steam plant in operation continuously during the time it is intended to run. It is creditable to an engineer to do so. It is a sign of fidelity to the interest of the owners and promotes the welfare of the employes by the avoidance of vexatious delays that often seriously affect their earnings. Any appliance or tool however simple, or any knack or method of performing any necessary work may be the means of enabling some engineer to better perform his regular duty so as to meet and successfully overcome some emergency. If a battle was lost for the want of a horseshoe nail, it is not too much to hope that some of the simple appliances described in these papers may be the means by which some engineer may win some of the many and perplexing mechanical battles he has to encounter in his work.

MANUFACTURES

J. F. Powers will erect a machine shop at Elkton, Md.

The Eagle Paper Company will erect a mill at Montpelier Ind.

J. D. Taylor and others will establish a sheet mill at Cambridge, O.

The Carolina Fiber Company, Hartsville, S. C., is to make additions.

New machinery is to be added to the Harmony Mills, Cohoes, N. Y.

The Tombigbee Cotton-mills, Columbus, Miss., will add machinery.

The capacity of the straw paper-mill at Salina, Kan., is to be increased.

Massachusetts parties will build a barrel-head factory at Skowhegan, Me.

The Blackstone (Va.) Textile Co. has been organized. Capital stock, $50,000.

New mills are to be built at Behring's water-power near Grand Rapids, Wis.

The Mohawk Valley Cotton-mills at Utica, N. Y., are adding new machinery to their plant.

It is reported that the Andrews Wire Works, at Rockford, Ill., will double their capacity.

The W. H. Jenkins Company, of Philadelphia, Pa., is to erect a plant at Worcester, Mass.

F. J. Buyck and others are forming a company, to build a cotton factory at St. Mathews, S. C.

The Foster Boiler Furnace and Manufacturing Company, at St. Louis, Mo., has been formed.

Parties at Cumberland, Md., are negotiating for the establishment of a silk-mill by Northern parties.

The Bradford (Pa.) & Kendall Street Railway Co. are applying to City Council to change to trolley system.

The stockholders of the Trenton Falls (N. Y.) Lumber Co. propose to build a pulp-mill at Prospect, N. Y.

Whitney & Co. propose to build a new factory in Leominster, Mass., 40x120 feet, two stories and basement.

Geo. D. Wadley and others have incorporated the Wadley Continuous Draw Bar Company, of Macon, Ga.

The Blaisdell Paper Pencil Company has been organized at Philadelphia, Pa. The capital stock is $100,000.

The American Paper Goods Co., of Kensington, Conn., will increase its capital stock from $175,000 to $250,000.

A plan is on foot for the erection of a factory at Faulkner, Mass., for the manufacture of patent shoe machinery.

Plans are now being drawn for a foundry addition to the Foster Machine Co.'s plant, 100x50 feet, at Westfield, Mass.

The American Enameled Brick and Tile Co., of New York, has been organized. E. H. Frank and others are interested.

The Babylon Wool Co. has been organized at Baltimore, Md., by R. M. Jobe and G. H. Dobson, with capital $50,000.

The Pajaro Valley Paper Co., of Corralitos, Santa Cruz County, Cal., has been organized by J. A. Hall, E. Caschi and others.

The National Hosiery Co., Albany, N. Y., is to remove to more extensive quarters, and will employ from 600 to 1,000 hands.

In Windsor Locks, Conn., G. P. Clark is to build a brick factory for the manufacture of rubber wheels, rolls, fans, trucks, etc.

At a recent meeting of the Kinston (N. C.) Knitting-mill's stockholders, an additional issue of $10,000 of preferred stock was decided upon.

The White Manufacturing Company, of Jersey City, has been formed for the manufacture of cars, car wheels, etc. The capital stock is $500,000.

The Defiance Button Machine Machine Co., of New York, has been organized, with capital $10,000. The directors are C. Krom and J. J. Rankin.

The Lodge & Davis Machine Tool Co., Cincinnati, O., have just received an order for $10,000 worth of their machine tools from the C. B. & Q. R. R.

The Mears Manufacturing Company, of Bloomsburg, Pa., has been organized with a capital of $30,000. Incorporators, Camden Mears and C. W. Miller.

A box factory is being established by Atwood & McManus, at Chelsea, Mass. The plant will cost when completed $25,000, and 60 hands will be employed.

The Tonkin Boiler and Engine Works Company has been organized at Oswego, N. Y. Capital $75,000; and directors, John Jermyn, John Cleland and others.

E. G. Smith, Columbia, Pa., writes us that he has furnished the Physical Department of the Michigan Mining School with twelve metric sliding calipers.

The Roth-Kasten Cycle Company, with $10,000 capital, has been incorporated in Milwaukee, Wis., for manufacturing bicycles. Incorporators, P. A. and E. W. Roth.

The Huber Vehicle Seat Company, with $10,000 capital, has been formed in St. Louis, Mo., for the manufacture of vehicle seats. Incorporators, J. P. and A. P. Huber.

The Carbonating Supply Company, with $10,000 capital, has formed to manufacture carbonating machinery. Incorporators, Samuel D. King and Herbert F. Kent.

The Dolson Nelson Co., of Horseheads, N. Y., has been organized, to manufacture boots and shoes. Capital, $20,000. Directors, W. L. Dolson, and F. D. Nelson.

The W. T. Jackson Company has formed to manufacture wagons, trucks and carriages at Chicago, Ill. Incorporators, W. T. Jackson and Geo. W. Barnett.

The Bradford (Pa.) Electric Light and Power Co. are putting in a 200 horse-power Ball engine, a 2,000 light incandescent dynamo, and a 50 arc light Westinghouse dynamo.

The Lewis Run Brick Co. has recently been organized at Bradford, Pa., with a capital of $30,000; also the Alumina Shell Brick Co., and two more companies to make pressed brick.

The Kingsley Foundry Co., with $23,000 capital, has been incorporated in Hammond, Ind., to carry on and engage in a general foundry business. Incorporators, W. P. Kingsley and others.

The works of the Shaw Electric Crane Company will be removed from Muskegon, Mich., to Plainfield, N. J., where new and larger shops will be erected, near the Pond Machine Tool Works.

The Cincinnati Milling Machine Co., Cincinnati, Ohio, issue a folding catalogue of milling machines, which is very finely illustrated, and contains brief descriptions of various machines.

The Emlyn Steel and Tin-plate Co., with capital, $250,000, has been formed in Chicago, Ill., to manufacture steel, iron and fine sheets, tin, and terne plates. Incorporators, John E Jones and others.

The Utica (N. Y.) Carriage Company, with $50,000 capital, has been organized for the manufacture of carriages, wagons, etc. Incorporators, Chas. S. Williams, Utica, and Willard T. Arweed, Stittville, N. Y.

The George Burnham Co., Worcester, Mass., issue a catalogue of Burnham drilling machines for light and moderately light work. They make a variety of such machines which are illustrated in the catalogue.

New Orleans, La., is soon to possess another cotton factory. The plant will be a very large one, and the immense sum of $2,500,000 is to be invested in the enterprise, which is believed to be mainly backed by local capitalists.

The L. D. Thompson Manufacturing Co., with capital, $20,000, has been incorporated in Cincinnati, O., for the manufacture of carriage, coffin and casket hardware and trimmings. Incorporators, L. D. Thompson and Robert W. Hasselhoff.

The plans for the new cotton-mill at Jasper, Ala., have advanced far enough for the plant to be counted a certainty. A capital of $125,000 is proposed, and over $90,000 has been subscribed. The mill is to be equipped with 10,000 spindles and 250 looms, and work on it will soon commence.

Henry R. Worthington, 88 Liberty street, New York, has issued two little books for distribution that will be of interest to World's Fair visitors and others. One is entitled, "World's Columbian Exposition and Handy Map of Chicago," and the other, "Worthington Steam Pumping Machinery." Both will be found instructive.

C. W. Morrison, of Ellsworth, Maine, in company with George B. James, of Boston, will soon build a large saw-mill on the Machias River, at Whitneyville, Maine. It will be constructed by W. H. Bronson, of Ellsworth Falls, who has the contract. When completed the mill will have five stave machines and one heading machine.

The Berlin Iron Bridge Co., of East Berlin, Conn., will build a new machine shop for the Fuller Iron Works, at Providence, R. I. The peculiarity of this shop will be that the sides are entirely of glass, under the patents lately granted the Berlin Company for this construction. The building will be 90 feet in width, and 210 feet in length.

There is water-works agitation at Ogdensburg, N. Y.; Unionville, Conn; St. Johnsville, N. Y; Chandler, Okla.; Waterbury, Conn.; Hillsboro, Ohio; Grand Forks, N. D.; Boston, Mass.; Newtown, L. I.; South Norwalk, Conn.; Rock Valley, Iowa; Silver Plume, Colo.; Chicago, Ill.; Houston, Tex.; West End, Ga.; Hoquiam, Wash.; Manchester, N. H.; Tipton, Ind.

Another new industry is to be established in New Bedford, Mass., the manufacture of Lambeth rope. A company has been organized, with capital stock $125,000. Prominent among those interested are F. R. Hadley of the Columbian and Bennett mills, C. W. Brownell and the directors of the Bennett mill. Lambeth rope, the proposed product, is a braided material made from cotton, jute or other fiber, and is adapted to various uses.

Machinists' Supplies and Iron.

NEW YORK, June 10, 1893.

Iron—American Pig—We quote Standard Northern brands, No. 1 Foundry, $14.50 to $15.25; No. 2, $13.50 to $14.25; Gray Forge, $12.25 to $12.50. Southern brands of good quality are obtainable at $14.25 to $14.50 for No. 1 Foundry; $12.75 to $13.50 for No 2 and $11.75 to $12.50 for Gray Forge.

Antimony—The market is steady. We quote L. X., 10¼c. to 10⅜c.; Cookson's, 10½c. to 10¾c.; Hallett's, 9⅞c. to 9 95c., and U. S. French Star, 10⅛c

Copper—The market is dull. Frequent offerings of Lake Copper are made at 10.85c. for summer delivery, and 10.90c. for prompt. Casting Copper is held at 10c. to 10⅛c

Lead—The market is on a decline; offerings at 3.80c. to 3.82½c. have failed to draw business. A forced sale was made at 3.75c. for July delivery.

Lard Oil—Prime City is quoted at 82½c. to 83c.

Spelter—The market is barely steady. Sellers are asking 4.25c. for New York delivery, but no business is reported.

Tin—Some business has been done at an advance to 19.25c. to 19.35c., but most of this was speculative deals. These figures may still buy, and there are offerings at 19.40c. for July, and 19.70c. for August and September.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Wanted—Foremanship; engines, pumps or general jobbing. Indicator, AMERICAN MACHINIST.

Wanted—Position as foreman boiler maker; 12 yrs'. exp.; ref. A1. A. M. P., Box 92, Roanoke, Va.

Draftsman (designer), mach. tools, jigs, fixtures, general mach'y, desires pos. H. M., AM. MACH.

Agents to sell sliding calipers, etc , liberal inducements. Address E. G. Smith, Columbia, Pa

Draftsman, designer, supt ; 7 years' exp., wishes change. A1 ref. Address "G. P.," AM. MACH.

Accurate draftsman, designer, age, 25, desires change of position. Permanent, AM. MACHINIST.

Mech. draftsman wishes position on machinery in general. Address K., 128 W. 61st. street.

A first-rate mach., of long exp , wants a steady position. Best refs. Box 1, AMERICAN MACHINIST.

A mech draftsman wishes sit. Ref., etc., given. Address W. S. S., 64 E. Main st., Springfield, O.

Wanted—Exp'd men on horizontal boring machines. Address Box 5, AMERICAN MACHINIST.

Mechanic, draftsman (29) with shop practice, and 7 years' drafting room experience, desires to change position. Address Box 2 AMERICAN MACHINIST.

Wanted—Situation as foreman in machine shop or tool room, in city or town near Boston. Best of ref. Personal interview desired. H., AM. MACH.

Wanted—Position as draftsman and designer by energetic progressive mechanic of prac. exp. and theoretic education. R. J., AMERICAN MACHINIST.

Pattern Maker Wanted—Steady job for good all around man. State experience, and wages wanted. Address Machine Shop, AMERICAN MACHINIST.

Young Norwegian, graduate of technical college, and with some practical exp., wants pos. as draftsman. Salary moderate. A Z., AM. MACHINIST.

Wanted—Foreman blacksmith on machine tool work; must be well posted on piece-work. Address Box 4, AMERICAN MACHINIST.

Machinist & tool maker 1st class on special machinery, experimental work, models, dies & gen. shop tools, wishes sit. in country. Box 6, AM. MACH.

Situation wanted, by mech draftsman (23) exp'd on machine tools and general machinery. Address Box 7, AMERICAN MACHINIST.

Wanted—Position as foreman or supt.; used to close interchangeable work; can design tools. Address Box 46, Simsbury, Conn.

Wanted—Position for July 1st by young mechanical engineer and draftsman, or at once charge of industrial concern at the World's Fair. Apply Box 135, AMERICAN MACHINIST.

Wanted—1st-class vise and floor hands of large experience; must be sober and industrious. Can secure steady employment. Married men preferred. Morgan Engineering Co., Alliance, Ohio.

Bookkeeper—Young man, 30, experienced in the accounts of machine shop & foundry, desires some position of trust. Thorough business training. Highest references. Bookkeeper, AM. MACHINIST.

A young pattern maker wishes to change; would like position as assistant to foreman, or could take charge if required; can furnish best of reference as to ability and character. Expert, AM. MACHINIST.

Wanted—Level-headed mechanic to take charge of small mach. shop. Chance for right man to grow. Say what you have done, and compensation expected. Address "Good Place," AM. MACHINIST.

Wanted immediately—A man to start and take charge night turn in machine shop. About 10 men at first. Good place for good man. Address Box 3, AMERICAN MACHINIST.

Wanted—Foreman blacksmith. Shop has 26 fires, 2 large steam hammers. Must be first class man. State refs., and wages expected, Bucyrus Steam Shovel and Dredge Co., South Milwaukee, Wis.

Wanted—An all around machinist; one accustomed to factory repair work, and to work on new machinery. Good position to right man. Address The Wabash Screen Door Co., Rhinelander, Wis.

Good draftsman, young, with good mechanical ability, experienced in designing special tools and mach'y, desires pos. in shop with good bus. man in need of mech. assistance Interest, AM. MACH.

1st-class draftsman, A1 mechanic, exp'd in superintend'g erection; hav'g good pat. specialty in power transmission, seeks pos., with open'g. Business, care AMERICAN MACHINIST.

Wanted—A foundry foreman; must be a man of experience who is capable of producing the highest class of machinery castings; cylinders a specialty; give references, age, experience and salary expected. Address Box 136, AMERICAN MACHINIST.

Draftsman (designer) wants pos., tech. graduate, 5 yrs' mach , 8 draftsman, and two had charge of drafting room (10 men). Exp'd on jigs and fixtures, light and heavy mach. tools, hyd. cranes, gen. mach'y. Box 140, AMERICAN MACHINIST.

Wanted—A practical mach. or pattern maker who is a capable draftsman One who has had some exp. in designing special machines and tools for making iron and brass valves, steam fittings, etc., pref'd. Address Box 139, AM. MACHINIST.

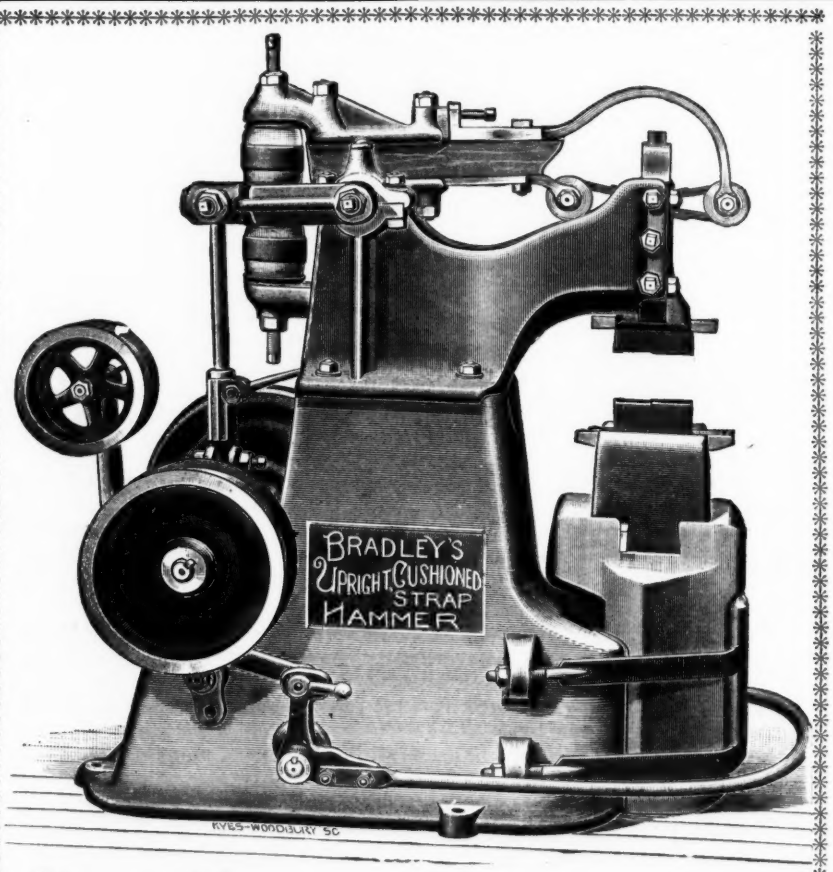
A mechanical draftsman and machinist, with 8 years' experience in office and shop, will be open for engagement on July 15, or sooner. Can take position as superintendent in small machine shop. Address W. A , AMERICAN MACHINIST.

Wanted—Machine shop, also foundry foreman for printing press works. Applications of competent, exp'd men in this line considered only. State age, where last employed, how long, and in what capacity. Address Jno. J Clause, Elkhart, Ind.

Wanted—A position by a live, energetic tool and die maker, who is thoroughly up in modern improvements on dies for iron and brass work. Has had exp. in best shops in Conn. Best ref., ability and habits; can accept second week of July. Distance no objection. Die Maker, AM. MACH.

Wanted—As instructor, an M. E. graduate with 3 yrs' exp. in the designing of machinery and in testing of steam plants; must be able to begin work Sept. 13. Address application and references to Prof. Mech'l Eng'g, 357 Market st., Bethlehem, Pa., stating past experience and salary expected.

(*Continued on page 12.*)



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If you plate, draw, square, taper or weld iron and steel, you need a Bradley Hammer.

If you swage, collar, spindle, or do any manner of die work, a Bradley Hammer will soon pay for itself.

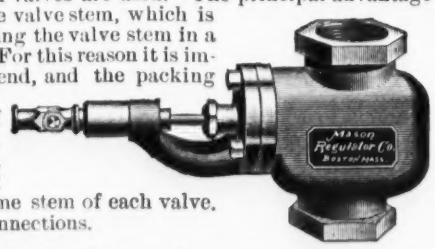
That the Bradley is the best Power Hammer in the market has never been questioned. Our circulars illustrate, describe, give sizes and prices.

BRANCHES: 14 Warren St., New York. 96-98 Sudbury St., Boston.

BRADLEY & COMPANY, Syracuse, N. Y.

THE MASON BALANCED VALVE

Is a double piston or seated balanced valve, for which we have found a ready sale in the many cases where such valves are used. The principal advantage of our valve is in the guide for the valve stem, which is cast on the bonnet, thereby keeping the valve stem in a direct line with the stuffing box. For this reason it is impossible for the valve stem to bend, and the packing seldom has to be renewed. The sizes up to two inch are made of the best steam metal; above that, of cast iron, lined with steam metal. A knuckle-joint tapped for three-eighths rod is on the same stem of each valve. This saves expense in making connections.



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Meet all requirements more fully and satisfactorily than any other of its competitors.

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INVESTIGATION IS CONVINCING.

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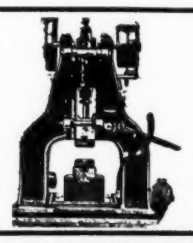
20 Johnson St., CLEVELAND, O.



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Ready Made Cast Gears.
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Gear Book, 15 cents.
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Gear Cutting Machines.
GEORGE B. GRANT,
Lexington, Mass.,
and 125 South 11th St.,
Philadelphia, Pa.

FOR SALE

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One 16'x36' Fishkill Corliss Engine with Boiler 5½'x14', 110 3" Tubes, Horizontal Tubular type; also about 75 feet 2-ply belting 20" wide, one 7' pulley 20" face, and a quantity of 5" steam pipe; feed water Heater with brass coil, 5" shafting and pillow block. All in first-class order.

ORRIN J. LODER.—*Supt.*

ROSE POLYTECHNIC INSTITUTE,

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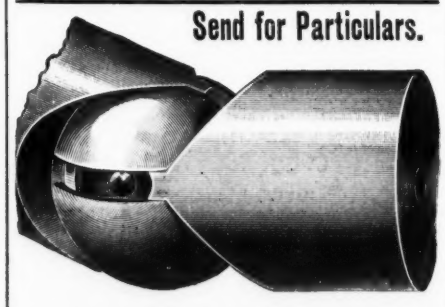
Send for Particulars.



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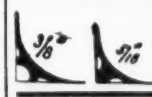
HARTFORD, CONN.

Flexible Metallic Fillet



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H. WHITE, 44 N. 4th St. Phila, Pa.

THE IRON FOUNDER,

By SIMPSON BOLLAND, Esq.

300 Illustrations. 400 Pages. 12mo. Cloth $2.50.

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MACHINE DESIGNING, MECHANICAL DRAWING,

Patent Office Drawing, Print Copies of all kinds and sizes. Lowest prices consistent with good workmanship. Correspondence solicited.

FRANK A. FOSTER,
Room 442 Butler Exchange, PROVIDENCE, R. I.

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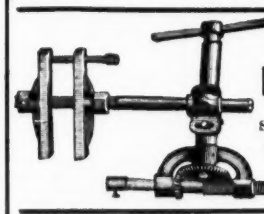

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Address: ELECTRICAL REVIEW, 13 Park Row, N. Y.

BRASS-WORKING TOOLS,

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BARDONS & OLIVER
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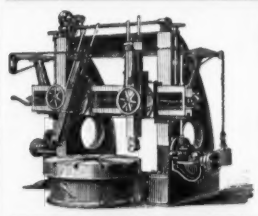

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COMBINING EVERY IMPROVEMENT.

14 SIZES FROM 5 TO 20 FEET.

BETTS MACHINE COMPANY,
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Chicago Office: 14 South Canal St.

ASBESTOS CEMENT FELTING,

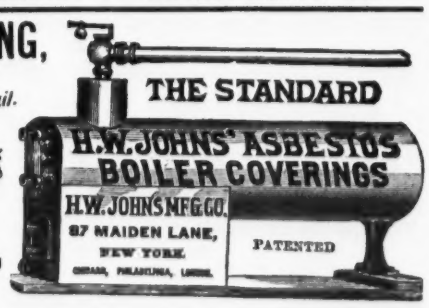
FOR LAGGING LOCOMOTIVE BOILERS.

Samples and Descriptive Price List Free by Mail.

We are prepared to take Contracts for applying Steam Pipe and Boiler Coverings in any part of the United States.

H. W. JOHNS MANUFACTURING CO.,
87 Maiden Lane, NEW YORK.

THE STANDARD



WANTED

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Supt. of a large manufactory employing 300 hands desires to make a change; am thoroughly familiar with the manufacture of all kinds of iron and brass goods, and well up in modern methods of economical production of work, and have had long exp. in handling help; age, 36. Ohio, AM. MACHINIST.

Wanted—A thoroughly practical and exp'd foreman, to take charge of a tool-room; design & oversee making of punches and dies, tools for milling & screw machines, etc. And supt'd the manufacture of small articles in large quantities, in very fine brass work. Exc't position for right man. Give age, exp., etc., Thorough, Box 142, AM. MACH.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d hd lathes & planers. S. M. York, Clev'd, O.

Auto. Steam Flue Cleaners. Kelley Co., Erie, Pa.

Punch & Drop Presses. Am. Tool W'ks., Clev., O.

For Sale—Second-hand drill presses, engine lathes & planers. Dietz, Schumacher & Co., Cincinnati, O.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Best Bolt Header in the world for $50. Address C. H. Baush & Sons, Holyoke, Mass.

Agent wanted to raise club in every shop. Money in it; write quick, Scientific Mach., Cleveland, O.

Monitor lathes 15″ & 30″ swing, $100 each. Screw-cutting lathe 17″ swing, $95. 229, AM. MACHINIST.

Wanted—Party to furnish tools and money to perfect a steam pump, the result of practical experience. Address Box 149, AM. MACHINIST.

We will pay 25 cents each for copies of the AMERICAN MACHINIST of December 4, 1886 issue; must be unsoiled and in good condition. AMERICAN MACHINIST PUBLISHING COMPANY, 203 Broadway, New York.

Machine Shop and Foundry for Sale—Located in a fine village in Central New York. At present employing 8 men building medium grade work. A rare opportunity for 1 or 2 practical men to engage in an established and growing business. If the whole is not sold soon, I will sell an interest to a practical man who can furnish references as to integrity & ability. A full opportunity to investigate offered any one meaning business. Box 150, AM. MACH.

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SCREW-CUTTING LATHES.

1 13 in. x 5 ft. Phoenix Iron Works, Rise and Fall Rest. Cheap: Good order
1 16 in. x 6 ft. New Haven Rise and Fall Rest. A order
1 16 in. x 7 ft. Bement, Plain Rest and Chuck; fine tool. A1 order
1 15 in. x 8 ft. Jones & Lamson, Rise and Fall Rest. Good order
1 16 in. x 6 ft. Blaisdell, Rise and Fall Rest. Good order
1 17 in. x 6 ft. Fitchburg, Compound Rest, fine tool Good as new
1 18 in., raised to 36 in. x 9 ft. Michigan Tool Works, Plain Rest A1 order

PLANERS AND SHAPERS.

1 16 in. x 16 in. x 3 ft. Belden & Co. Planer. A1 order
1 20 in. x 20 in. x 5½ in. Pratt & Whitney Planer. A1 order
1 20 in. x 20 in. x 4 ft. New Haven Planer. A1 order
1 30 in. x 30 in. x 8 ft. Hewes & Phillips Planer, fine tool. Good as new
1 40 in. x 36 in. x 10 in. New Haven Planer, bargain. A1 order
1 6 in. Boynton & P. Crank Shaper. A1 order
1 15 in. Juengst Friction Shaper, with Vise. Good order
2 24 in. Hendey Friction Shapers, complete. Good order

MISCELLANEOUS.

2 Garvin No. 1 Gear Cutters. Good as new
1 Brown & S. No. 1 Universal Miller, complete. A1 order
1 Garvin No. 5 Heavy Miller, Late Pattern. A1 order
1 Garvin No. 2 Two-spindle Drill Press. Good order
1 Garvin No. 3 Four-spindle Drill Press. Good order
1 Barnes Friction Disk Drill Press. Good as new
1 10 in. Slate Sensitive Drill Press. Good order
1 24 in. Dexter Drill, Back Geared, Power Feed. Good as new

A lot of Grinding Machines, Power Presses, Foot Presses, Shears &c.

700 New and Second-hand Tools in stock. Write for complete list, Photographs and Prices,

THE GARVIN MACHINE CO.,
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84x84x16½ ft. Planer. Niles Tool Works, three heads.
Planers. 62 in. x 22 ft. | Planers. 25 in. x 5 ft.
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" 36 in. x 12 ft. | " 24 in. x 4 ft.
" 31 in. x 8 ft. | " 22 in. x 5 ft.
" 26 in. x 7 ft.
80 in. x 18 ft. Engine Lathe Geared Face Plate.
60 in. x 45 ft. Double Engine Lathe.
52 in. x 35 ft. Engine Lathe Horizontal Boring Machine, one end.
30 in. x 28 ft. Pond Machine Tool Co Shafting Lathe.
36 in. x 16 ft Engine Lathe.
" " "
33 in. x 27 ft.
32 in. x 12, 14, 16, 18 ft. Bed. New Engine Lathe.
28 in. x 22 ft. Engine Lathe, cheap.
25 in. x 12, 16, 20 and 24 ft. Bed. New do do
21 in. x 10, 12 ft. Bed. do do do
20 in. x 5, 6, 8 & 12 ft. do 2d Hand do do
18 in. x 6, 7 & 8 ft. do New & do do do
17 in. x 8 ft. do do do do
16 in. x 6 & 8 ft. do do do do do
15 in. x 6 & 8 ft. do do do do do
14 in. x 6 ft. do do do do do
Car Axle Lathe, Bement. | Driving Wheel Lathe 88 in.
15, 16, 18, 25 in. Crank Shapers. | Wheel Quartering Mach.,
20, 24, 26 & 30 in. Geared Shapers. | Double right and left hand.
20, 23, 24, 28, 30 & 36 in Drills. | No. 0 Turret Lathe,
Bolt Cutters. | Am. Tool and Mach. Co.,
8 and 13 in. Stroke Slotters. | 24 in. Swing, 8 ft. Bed.
Lot of Lincoln Pattern Millers and No. 1 P. & W. Millers.
4 Spindle Drills. Garvin.
Gear Molding Machine. Stamping Press, Bridgeport.
1100 and 3000 lb. Bement Steam Hammer.
100 lb. Steam Hammer. | SEND FOR MAY LIST.
40 H. P. Vert. Engine. N. Y. S. S. P. Co.
11 in. x 18 in. Hor. Engine. A1 Order.
16 in. x 42 in. Corliss and 16 in. x 48 in. Brown Eng.
300 H. P. Westinghouse Comp'd Engine.

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120 BROADWAY, NEW YORK

MACHINE TOOLS

NEW AND SECOND-HAND.

ENGINE LATHES.

13 in. x 6 ft., Complete. Cpd. Rest and Cross Feed. Improved style
14 in. x 6 ft., do Prentice, Hendey and Fitchburg
16 in. x 6 ft., do Hendey Fitchburg and Prentice
16 in. x 6 ft. do Bridgeport Mach. Tool Works. Good order.
16 in. x 8 ft., Improved style. Cpd. Rest and Cross Feed.
18 in. x 8 ft., Complete. Horton's. Improved style. "New features."
20 in. x 8–10 ft., do Cpd. Rest and Cross Feed.
21 in. x 10 ft., do do do do Perkins
22 in. x 10–12 ft., do Improved style. Ex. heavy.
24 in. x 12–14 ft., do do do
28 in. x 16 ft., do do do
30 in. x 18 ft., do Old style. Fair order. Cheap.
96 in. x 16 ft., Triple geared. 84 in. Face Plate. Good order.

PLANERS.

21 in. x 5 ft., Complete. Fair order. Price $125.
22 in. x 5 ft., do with Chuck, Putnam. A1 order.
24 in. x 6 ft., do New Improved style.
28 in. x 6 ft., do Putnam. Good order.
28 in. x 6 ft., do Good order. Low Price.
30 in. x 10 ft., do Modern style. Ex. heavy. A1 order.
36 in. x 12 ft., Extra weight and power. Powell Planer Co.

SHAPERS.

6 in. Stroke, 22 in. Feed "Crank" Good order Cheap.
8 in. do Crank. Good order. Gould
9 in. do do Extra heavy. Hewes & Phillips
13 in. do do do Good order.
14 in. do do Tray. Head. Improved style. Fitchburg
15 in. do do "New Improved Style."
22 26 in. do Triple Geared. Improved.

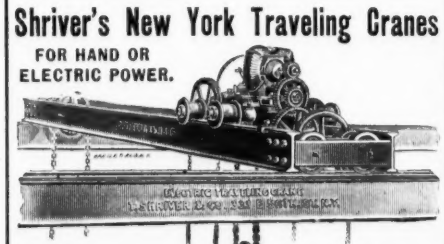
MISCELLANEOUS.

Radial Drills, 3, 4, 5 and 6 ft. Arms. Improved.
Upright Drills, 20, 21, 25 and 32 ins. Prentice.
Upright Boring and Turning Mill 38 in. A1.
Brown & Sharpe Vertical Turret Machine A1 order.
Universal Milling Machine. Improved style. "New features."
Milling Machines. Standard sizes. Improved style.
Lincoln Milling Machine. With Vise. Good order.
Screw Machine 15-16 in. Back gears. Auto. feed, Chuck and Tools Complete. Jones & Lamson. A1 order.
Tool and Auto. Knife Grinders. Good order.
Boiler Bending Rolls, 8-10 ft. "Improved style." Hinged housing

J. J. McCABE,
SUCCESSOR TO E. P. BULLARD'S N. Y. Mach'y Warerooms. | 14 Dey St., NEW YORK.

Shriver's New York Traveling Cranes

FOR HAND OR ELECTRIC POWER.



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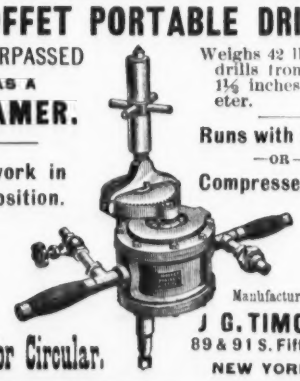

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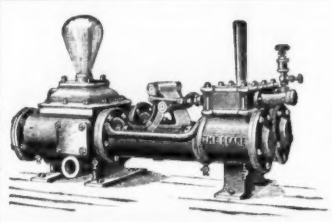

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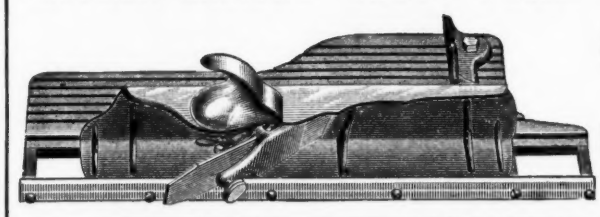

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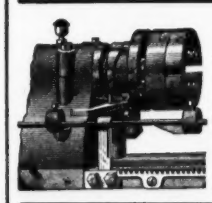

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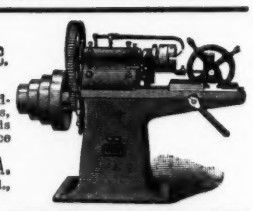

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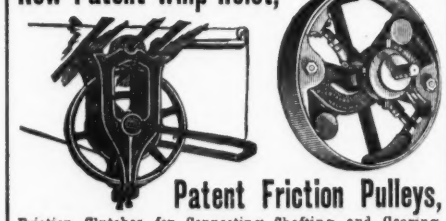

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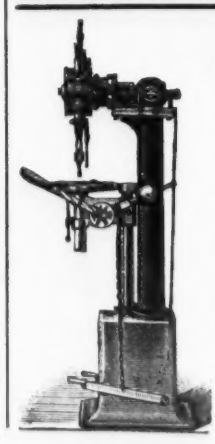

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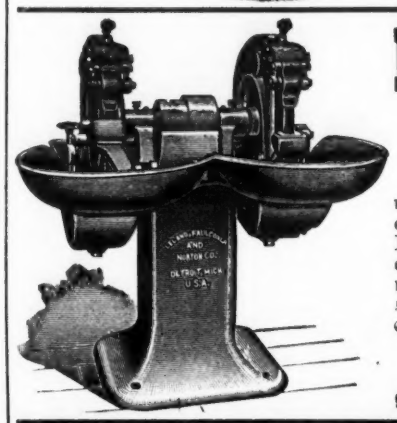

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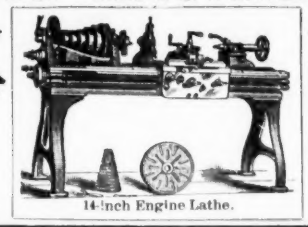

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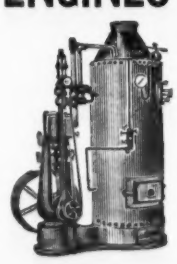

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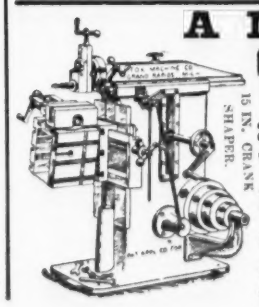

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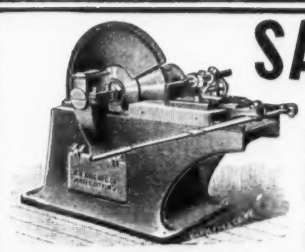

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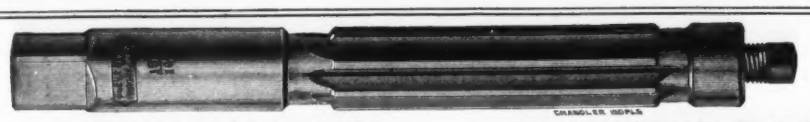

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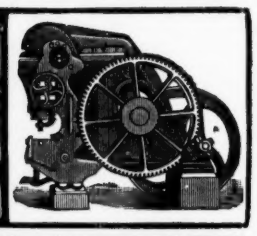

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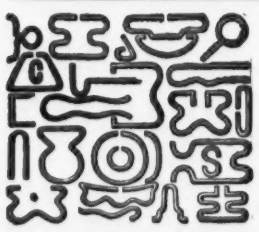

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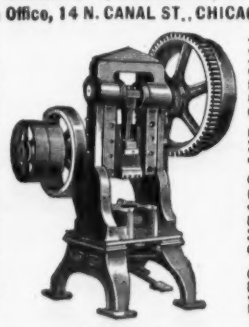

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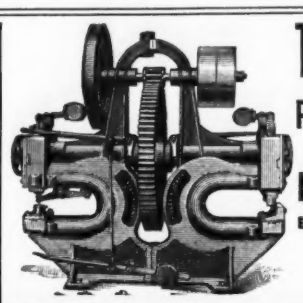

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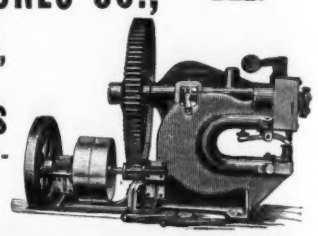

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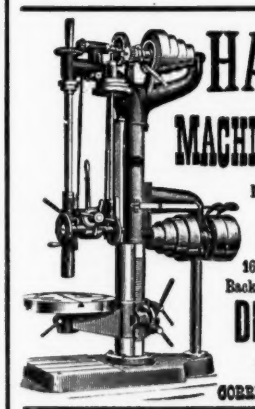

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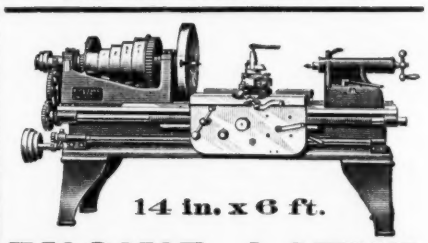

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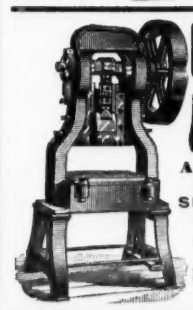

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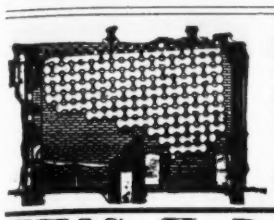

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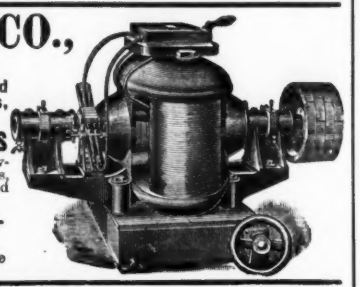

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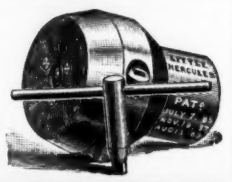

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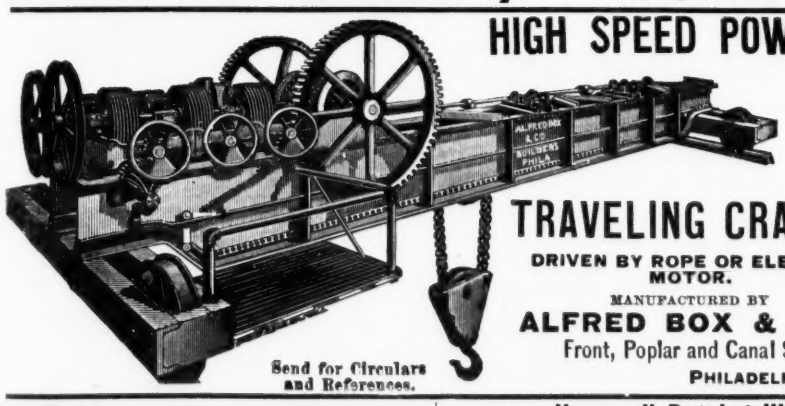

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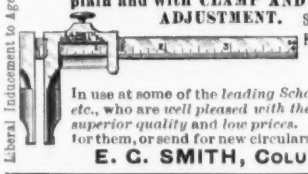

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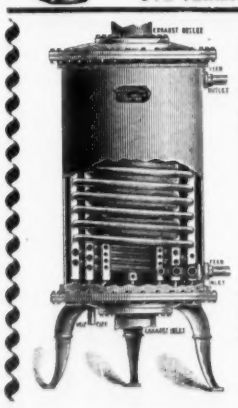

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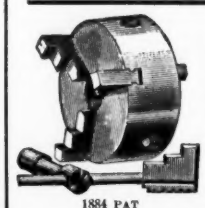

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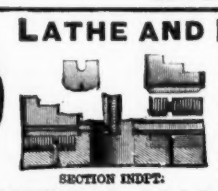

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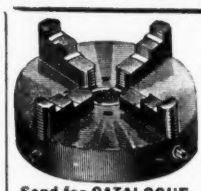

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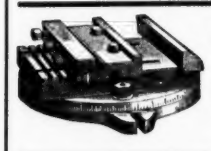

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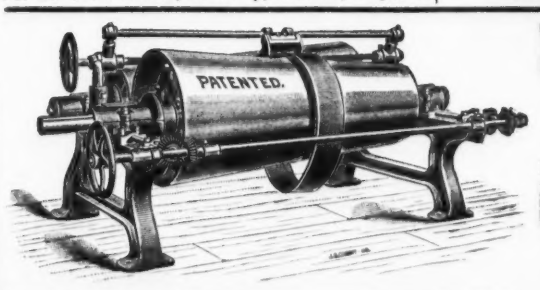

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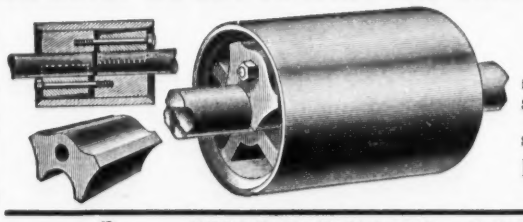

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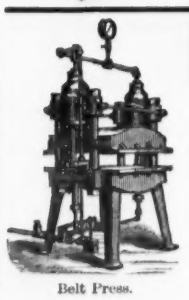

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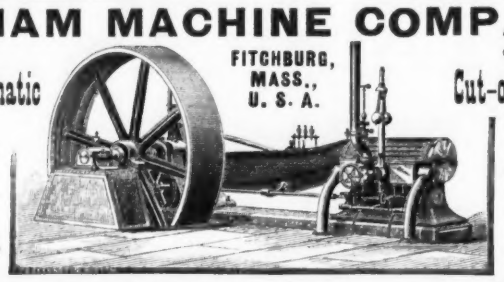

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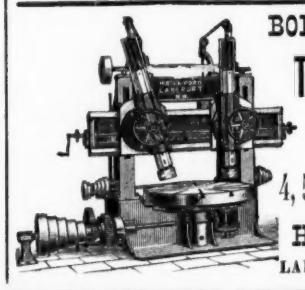

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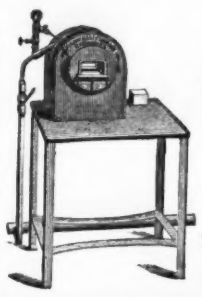

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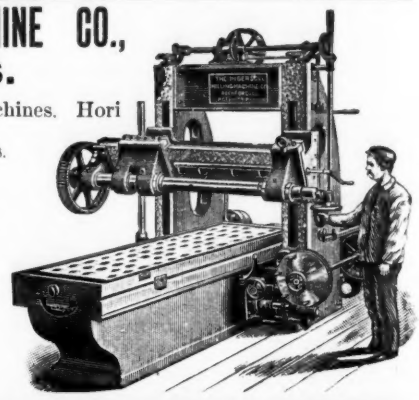

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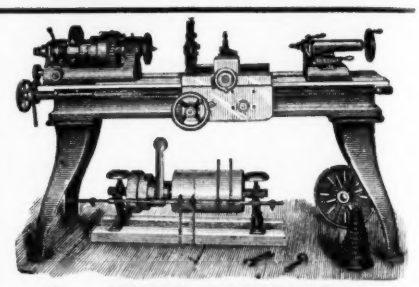

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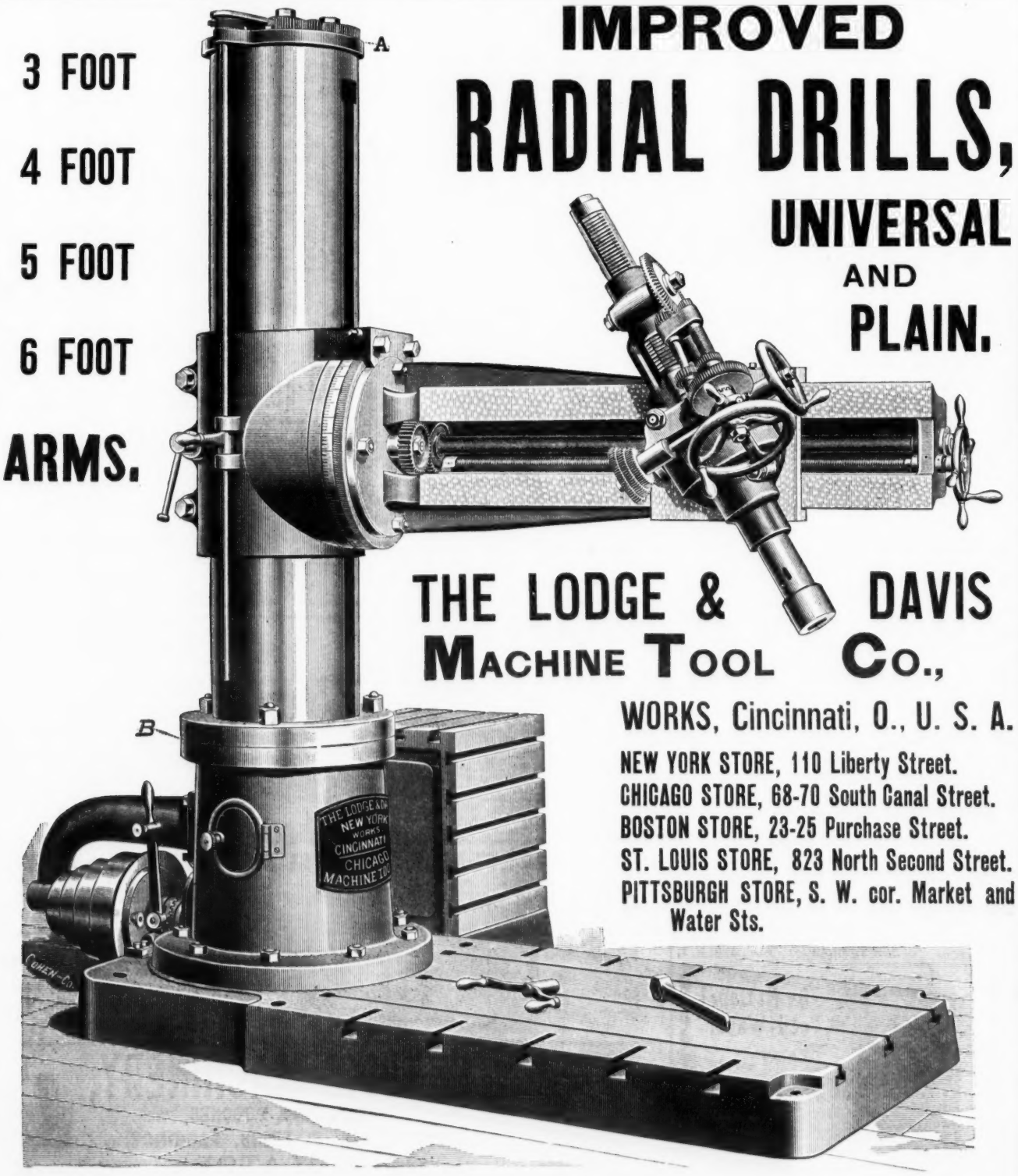

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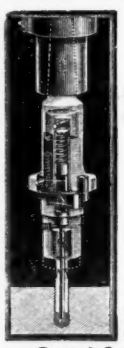

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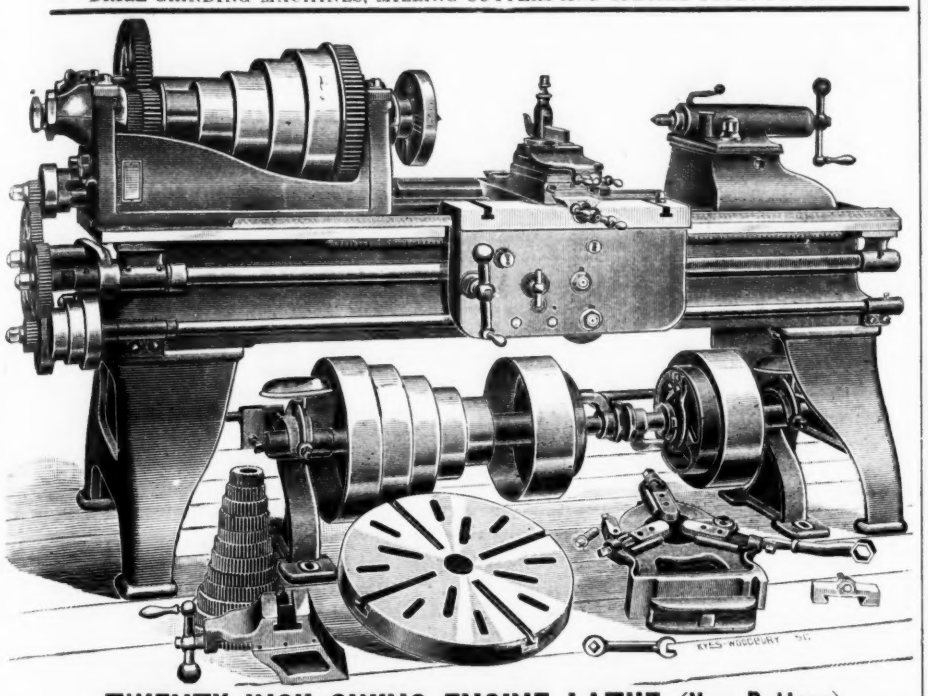

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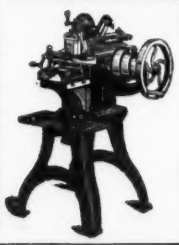

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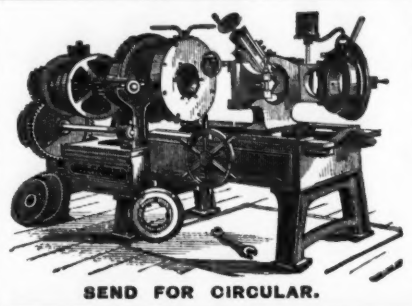

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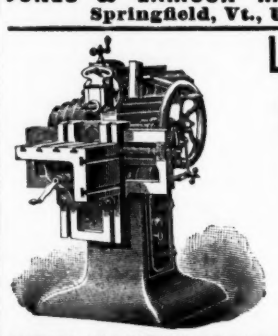

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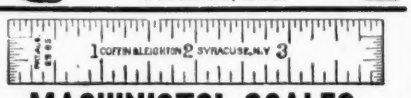

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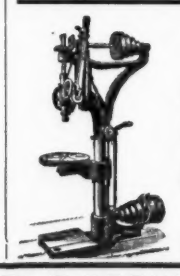

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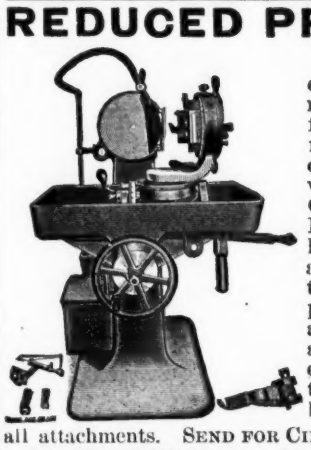

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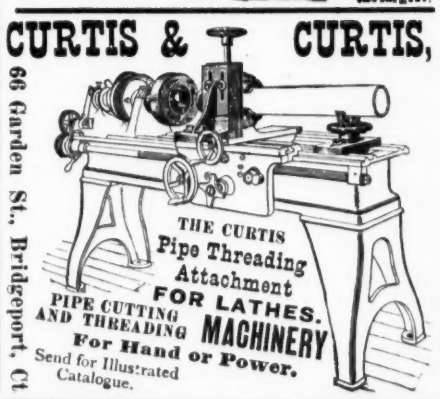

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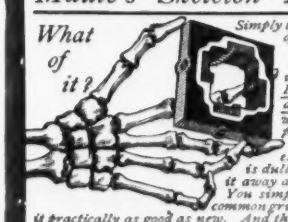

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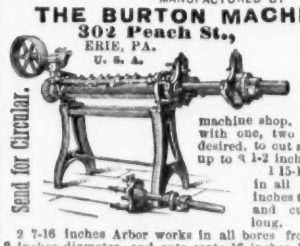

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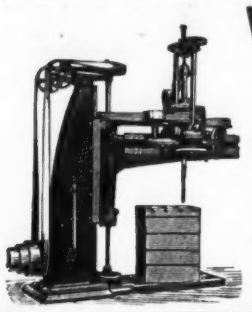

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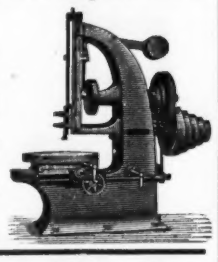

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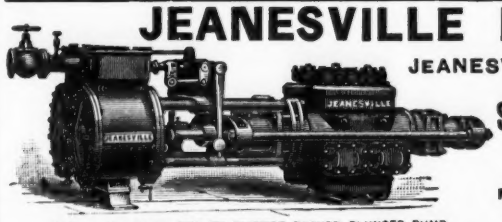

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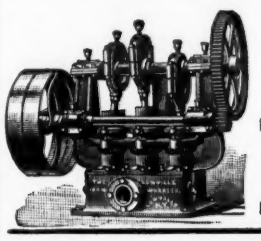

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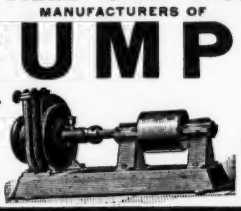

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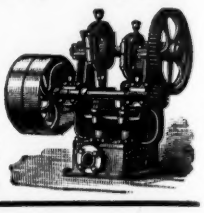

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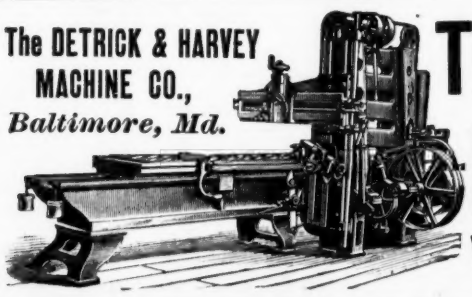

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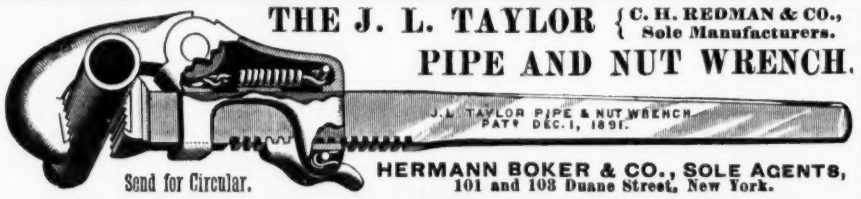

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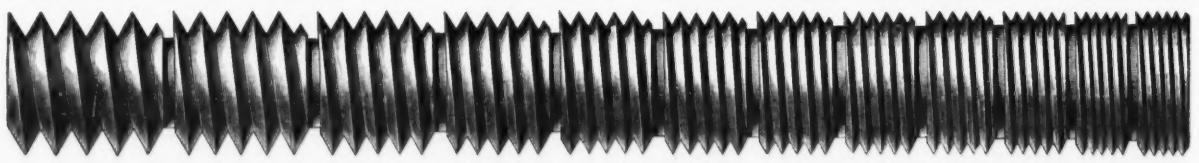

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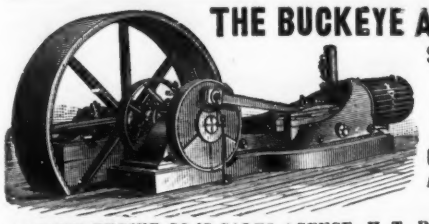

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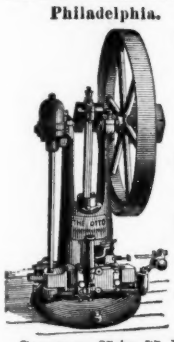

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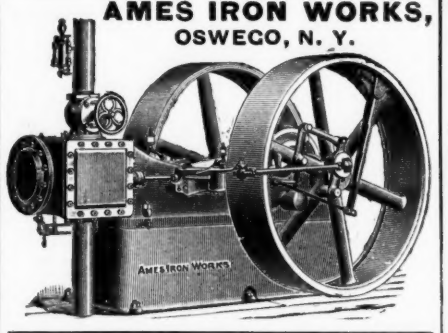

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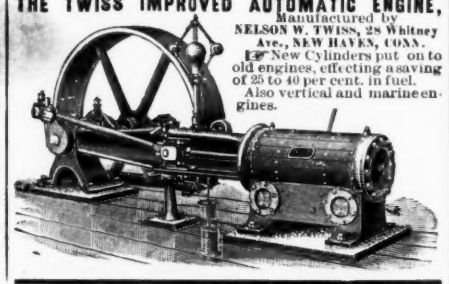

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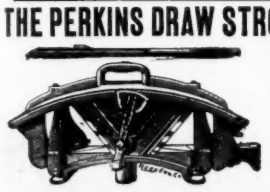

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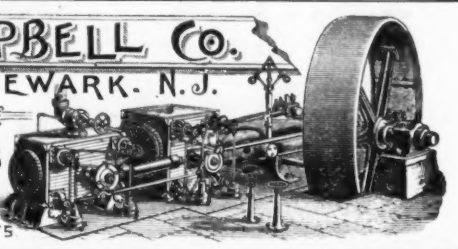

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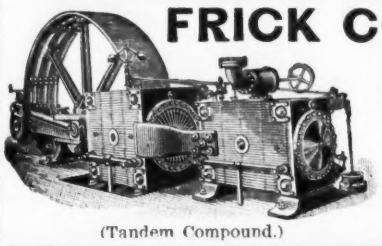

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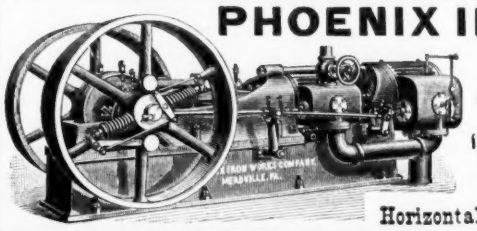

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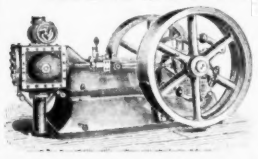

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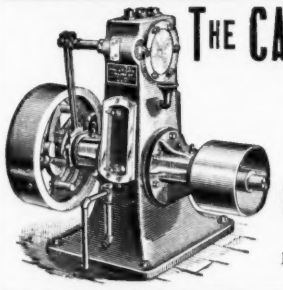

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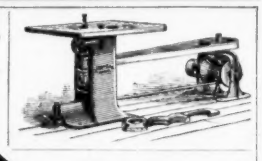

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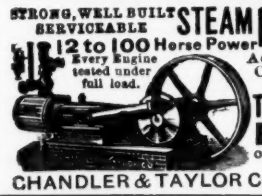

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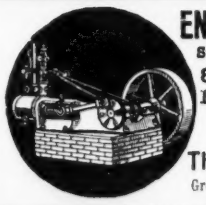

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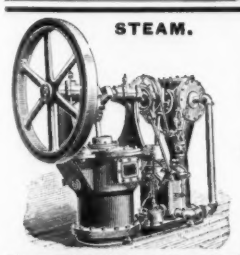

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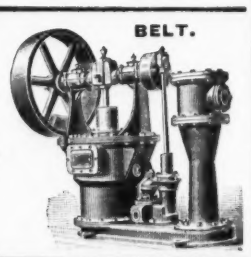

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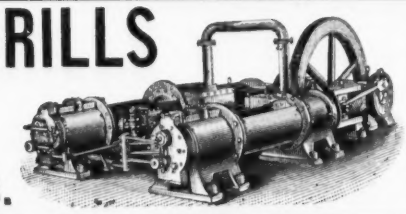

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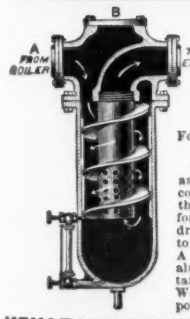

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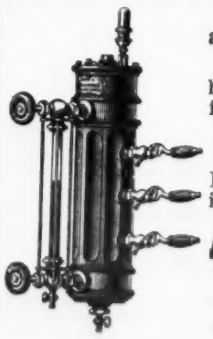

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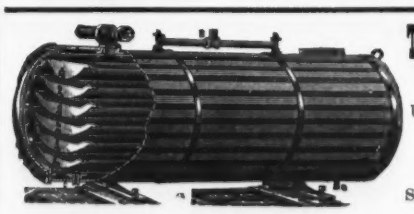

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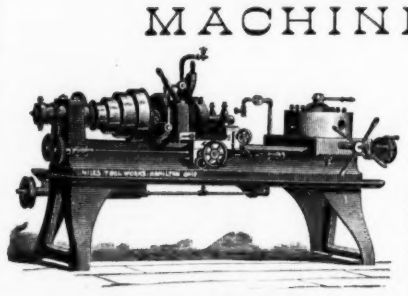

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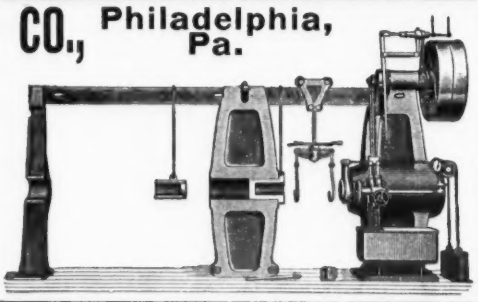

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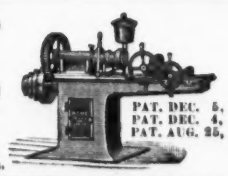

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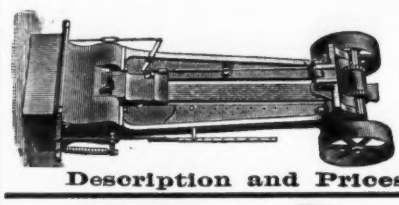

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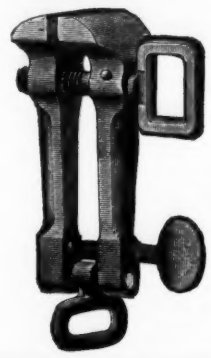

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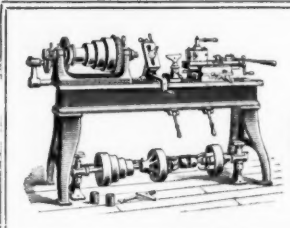

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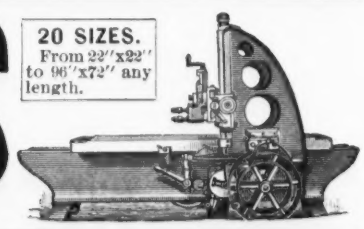

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